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The Vaulting of the Crypt of Glasgow Cathedral.

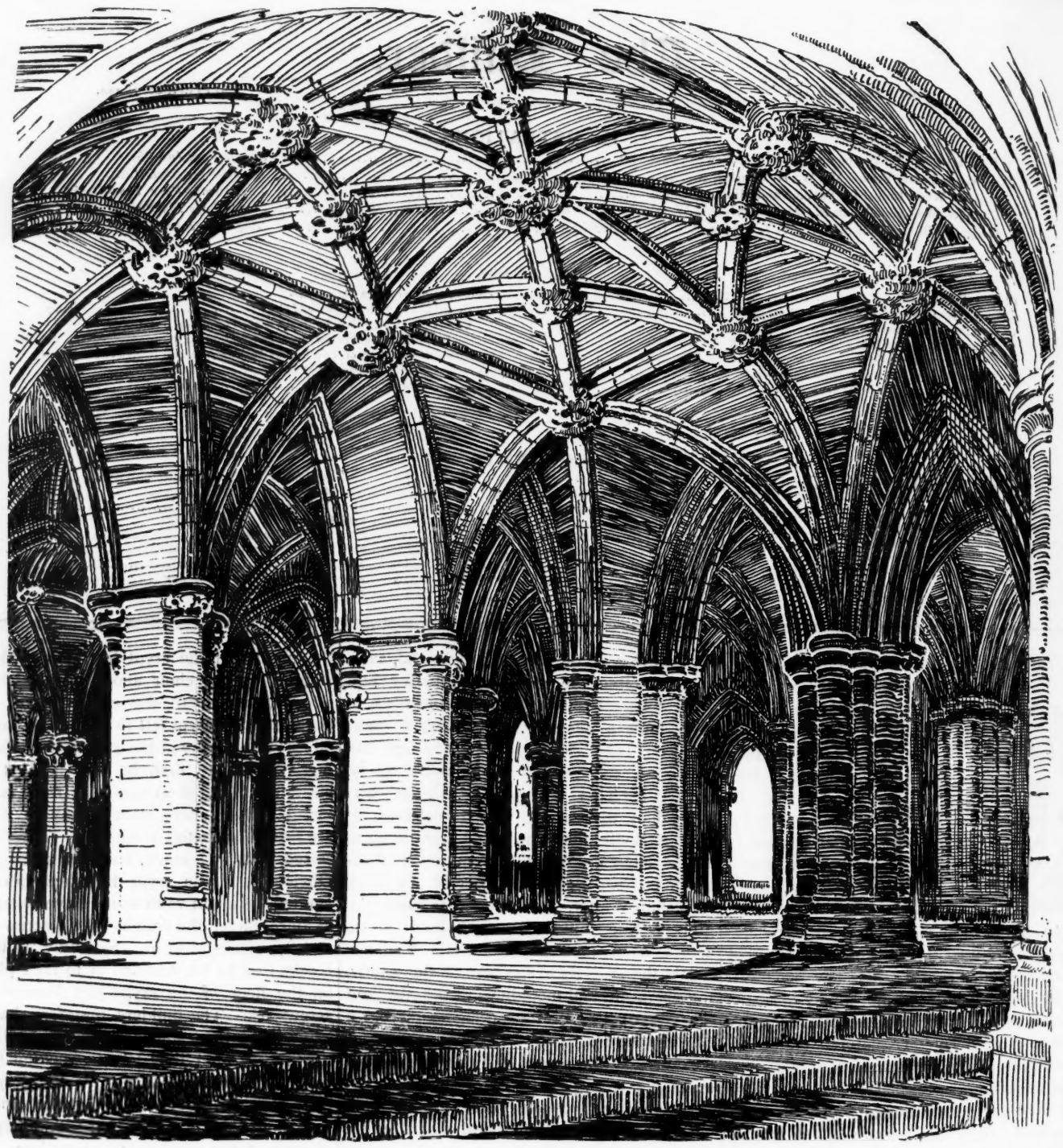
OF the many beautiful examples of thirteenth century work which survive to us in England and Scotland none is more successful in design, more original in plan and elevation, and more beset with archæological difficulties than the double choir of Glasgow Cathedral. In his new book Mr. Watson* has gone far, if not finally to dispel ancient illusions and misconceptions, at any rate to provide copious material for a full elucidation of the growth and uprearing of this remarkable work. He has provided seventy-eight illustrations, some of them measured drawings, some photographs, others coloured plans, by the aid of which it is possible to test the theories proposed by himself and others. His own theory, first propounded in 1886, has not yet made converts of other experts. Messrs. MacGibbon and Ross, in the third edition of their work on the "Ecclesiastical Architecture of Scotland," withdraw the modified approval which they had expressed in previous editions. Mr. Thomas Ross, in the third Rhind lecture, delivered in 1900, says, "Probably the original plan of the crypt is the plan we see to-day." Mr. John Honeyman, in the "Book of Glasgow Cathedral," retains his opinion that in the crypt we have the original design. All this is naturally very disheartening to the author of a theory. Nevertheless, we think that it hardly justifies Mr. Watson in asserting that "a change of design in the middle compartment of the crypt is not within the range of intelligent controversy." This is perilously close to bad language; and it is unnecessary, for Mr. Watson has a strong case. It may be stated as follows:

What documentary evidence there is as to the building of the present cathedral, as is only too often the case, is conflicting and misleading. Bishop Jocelin is recorded to have built a choir or a part of a choir between 1175 and 1179; and to him the whole of the present choir used to be ascribed. This is manifestly impossible. From him the credit was transferred to Bishop Bodington, who ruled from 1233 to 1258. Now Mr. Watson, with much likelihood, ascribes the earlier part of the work to Bishop Walter, who ruled just when the great Gothic building period was at its zenith, from 1208 to 1232. His guidance lies in the analysis of the plan of the vaults, the curvature and mouldings of the ribs, and the construction of the springers. From a consideration of these he arrives at the conclusion that the work was done in five instalments, with, possibly, short intervals between them, between the years 1220 and 1270 or thereabouts. To the first period belongs the south-western compartment of the crypt. Here the ribs are pointed in section; and in order to bring them all to the same height the diagonals are segmental, while the transverse arches remain semicircular. To the second period belong the north and south aisles of the crypt. Here the diagonals are semicircular; the other arches of the vault are pointed. To the third period belong the north, south, and eastern aisles, and the eastern chapels of the choir above. The mouldings of the ribs here are of later character; and ridge-ribs, both longitudinal and transverse, are introduced. To the fourth period belongs the famous and intricate vault of the middle compartment of the crypt. Here the mouldings of many of the ribs are again later in type, and the ribs are interwoven into geometrical patterns by the addition of liernes. The fifth period includes the stair vaults in the crypt, which have tiercerons or intermediate ribs, and late angular mouldings. To these must be added much of the vaulting in the eastern chapels and aisle of the crypt, as the same late mouldings occur there.

Two objections present themselves to the above order of operations. First, why was the middle of the crypt left open, and not vaulted, till the choir above was finished? Second, why were the eastern aisle and chapels of the crypt left to be vaulted last of all? The answers of the author are interesting. As to the first, he tells us that the clearstory of the choir was built *from inside*, and that it contains stones many of which are nearly half a ton in weight. These were raised, not by a crane, but by a screw-jack. Obviously, if the crypt had been already vaulted, its slight vault would have collapsed at once under the weight of the screw-jack and the blocks of stone. Secondly, all these blocks had to be wheeled in to their places on the floor of the crypt just beneath the screw-jack. The builders, therefore, had to leave an opening somewhere in the walls of the crypt. That they left an opening for a long time in the east wall of the crypt is plain from the fact not only that the vaulting hereabouts is late, but that the middle piers of some of the two-light windows have later mouldings than the jambs, and, therefore, were not built till much later than the latter, so as to leave passage for the carts.

As to the peculiar vault of the middle crypt, it has no doubt its rationale, if we could find it. Probably it is partly due to constructional reasons, partly to considerations of ritual. In the first place, its plan is conditioned by the fact that the middle crypt has three arches to the west but only two to the east; these two conditions have to be brought into harmony. Secondly, it was necessary to glorify one part of the crypt where was to stand the famous shrine of St. Kentigern, and another part where was to be placed the altar of the Virgin Mary (owing to the fall of the ground there could be no projecting Lady Chapel in the upper choir). To the west, therefore, but nearly central in the crypt, in a small square compartment, surrounded by four pillars, was placed the shrine. And to the east and west of it two large compartments were vaulted, after the manner of Lincoln Morning Chapel, with a central stalk; while in front and to the west of the altar of the Virgin, that there might be no obstruction,

* "The Double Choir of Glasgow Cathedral; a Study of Rib-vaulting." By T. L. Watson, F.R.I.B.A. Glasgow: James Hedderwick & Sons. 1901.



Glasgow Crypt. East.

another large compartment was vaulted, like the Lincoln Consistory or Southwell Chapter House, *without* a central pier. Hence the exceedingly bewildering plan of this crypt.

Mr. Watson's hypothesis is coherent and well argued. How far his evidence is trustworthy could only be ascertained by a detailed examination *in situ*. It will be little to the credit of the Scottish architects if they fail to test rigorously the mass of detail which is now laid before them. For ourselves, it must be said that Mr. Watson's treatment appears now and then not to be rigorously critical. It is altogether unscientific to appeal to French Gothic as a guide to English chronology (p. 105). The two Gothics, English and French, went on in the main independently and at a different pace. Moreover, in England itself, as Mr. Prior has well shown in his "Gothic Art in England," there was not one school of Early English Gothic, but several. Mr. Watson must make up his mind whether Glasgow is to be correlated with the Canterbury and Chichester Gothic or with that of Wells and Cwm Hir, or with Lincoln, or with Yorkshire Cistercian. He must not appeal to them all at random. Moreover, he has an objectionable way of turning his probabilities a few pages later into certainties, *e.g.*, "The church of Jocelin must have been pulled down by Walter," p. 20, becomes on p. 22, "We have seen that Jocelin began by pulling down the unfinished church of Jocelin." What he ought to have said is, "We hazarded the conjecture," and a very unlikely conjecture it is. For he tells us that the portion of the church carried out either wholly or in part by Jocelin between 1175 and 1179 was a choir with vaulted crypt, and probably also with vaulted aisles. We should want a great deal of evidence, of which Mr. Watson adduces next to none, to induce us to believe that such a great mass of recent work was pulled down only twenty years later; builders, at any rate in England, were practical men, nor were their employers millionaires. On several minor points the book gives us pause. Viollet-le-Duc is quoted as saying that all the great cathedrals of central France were commenced between 1180 and 1240. It is well known that Notre Dame, Paris, was commenced in 1162, and Sens nearly twenty years earlier. The ridge-rib is said (p. 72) not to be found in our earlier vaults; it occurs in Ripon transept (c. 1170). Nor is it likely that the tierceron or intermediate rib was introduced because some additional support was needed for the ridge-rib in the larger vaults (p. 90); rather it was introduced to facilitate filling in, especially by panels. We are told that the stair-vaults, with tiercerons and abbreviated ridge-ribs, could not have been produced earlier than 1270; both forms of rib occur in the vault of Lincoln nave. Nor is there any reason to assume that the foliated capital shown in fig. 11 is of later date than its twelfth-century base; simple trefoil capitals of this character occur sporadically throughout England and Wales in the last twenty years of the twelfth century—*e.g.*, in Chichester presbytery, St. Anne's, Lewes, Llandaff, Cwm Hir.

Nevertheless, the book is a most valuable

Glasgow Crypt. Site of the Shrine of St. Kentigern.

contribution to architectural literature, and especially to the history of Gothic vaulting in Great Britain. But it is plain that, in any final attempt to settle the disputable chronologies of Glasgow choir, attention must not be fixed on the vaulting alone. Plan, bay design, piers, capitals, bases, indeed every architectural member, will have to be studied; and from a synthesis of the whole a conclusive determination may be arrived at.*

CAN WE DATE OUR SAXON CHURCHES?—II.

By Professor Baldwin Brown.

In the last paper attention was called to the importance for Anglo-Saxon art of the connexion of England with the Carolingian Empire. England gave in learning and religion what she received back again in another form in architecture. The term "Carolingian" is, geographically speaking, a very wide one, for the Empire of Charles the Great extended from Spain to the Danube and the Elbe. This vast region, however, fell naturally into two halves, the earlier Neustria and Austrasia, prefiguring the later France and Germany. The English came in contact with both west and east, for Alcuin was settled at Tours and planted in its school his own Northumbrian learning, while Willebrord and Boniface wrought the conversion of Frisia and Central Germany. Willebrord and Boniface were accompanied and followed by such a large number of Anglo-Saxon ecclesiastics, like Pirmin the founder of Reichenau, and Lul who succeeded Boniface in the See of Mainz, that it was specially with the regions beyond the Rhine that our countrymen became connected, and our architectural forms in consequence take after those of the east rather than of the west.

Putting aside the crypt or chapel at St. Gervais above Rouen as being still essentially Roman, we may divide the early mediæval monuments of the Frankish empire into two groups. One is marked by the Gallo-Roman *petit-appareil*, sometimes with lines of brick (Basse Œuvre, Beauvais; Vieux-Pont-au-Auge), and especially by an elaborate mosaic-like treatment of facing-stones (St. Christophe, Suèvres; Cravant; St. Jean, Poitiers). These kinds of work are almost entirely confined to the western regions, the only two examples eastward being the so-called Clara-Thurm at Cologne, and the entrance gatehouse to the cloister of Lorsch, near Worms. The careful monograph on the latter, by R. Adamy, has recently thrown a welcome light on the origin of this notable little monument. It is of earlier date by some thirty years than Charles the Great's minster at Aachen, and was built under the rule of a brother of Chrodogang, Bishop of Metz, and with the help of monks transferred to Lorsch from a convent near Metz, from the neighbourhood of which part of the material was conveyed. It is therefore not a local architectural product, but really belongs to the region west of the Rhine. It thus falls into line with the other mosaic-faced structures already referred to, for which the name "Merovingian" has been with some reason suggested. In any case, the architectural tradition known as "Carolingian" does not begin with Lorsch, which is exceptional, but with the minster at Aachen of about the year 800.

From this time onwards there are differences growing more and more marked as time advances, between the Romanesque of the western and eastern provinces. The Frankish architecture of the west gives birth in the fulness of time to the Norman style. This preserves the old facing technique with *petit-appareil* and decorative herring-bone work and *opus reticulatum*, whereas we could hardly find an example of these east of the Rhine. Normandy employs the buttress, while this feature, after Aachen which has it at the corners of the Octagon, does not appear in early German Romanesque, its place being taken by the decorative pilaster, or *Lisene*. Germany employs the double-splayed window, while the Normans confine themselves to the internally-splayed form. In Germany the column is in frequent use in nave arcades, while in Normandy we find almost exclusively the pier. The characteristic *early* Norman cap is a rude Ionic; the cubical cap is just as characteristic of the eastern province. The mid-wall work universal in Germany is modified in Normandy by recessing. Finally, in the composition of western ends, though the twin-towered scheme is equally characterestic of west and east, yet Germany alternates with this the single western tower not found in the western province, and derived by some from the tower-shaped frontal of the minster at Aachen.

Turning from the west to the east, we find that the monuments which represent the eastern tradition are as a rule dateable, and form a continuous series from Aachen onwards. The so-called Eginhard-Basilica at Michelstadt in the Odenwald, begun in 827 A.D., though only partially preserved, is especially valuable. A little later we have the fine churches of Saxony, of which Gernrode, of the tenth century, is the earliest and most interesting; and from this date onwards to the culmination of German Romanesque in the twelfth century examples are too numerous to mention. It is suggested here that Anglo-Saxon architecture in all but its earliest forms has strong affinities with this early Romanesque of the eastern parts of the Frankish realm, and is out of all

* A plan of the crypt appeared in the *Builder* on July 1, 1893.

historical relation to the Romanesque of the west as displayed in Normandy.

Upon this basis we can understand why it is that, whenever definite details are forthcoming, it is comparatively easy to tell late Anglo-Saxon work from Norman, and why the character of our architecture was so decisively changed at the Conquest. We can understand, too, how, in spite of this change, there are features in our English Norman that do not appear in the Duchy, such features representing to some small extent (for the west greatly predominates) a fusion of the styles of the two provinces. With these questions we are not now concerned, and it remains to draw out some of the consequences for Anglo-Saxon chronology of what has just been put forward. We will deal in turn with *Lisenen*, with the various forms of window-openings, and with mid-wall work, including the caps of dividing shafts.

I. *The Lisenen.*—These appear as we have seen at Lorsch, about 770 A.D., but have here the distinctly Classical form of short fluted pilasters with debased but somewhat elaborate Ionic caps. They do not appear at Aachen or Michelstadt or at Eginhard's other basilica at Seligenstadt, but we find them again, and still with Classical bases and caps, on the lower stages of the west front of St. Castor, Coblenz, dating from the end of the ninth century. A little later, at the west end of Gernrode of about 960 A.D., the lisenen are losing the character of Classical pilasters and becoming long upright strips either ending under a flat string-course or joined at the top by an arcading of small arches. On the north-west tower of Gernrode these arches are straight-sided, on the other round-headed, and where they spring from the pilasters these last have imposts with a hollow chamfer. Later on the lisenen are often quite plain, but are generally joined by the round-arched arcade, and in this shape, no longer suggesting antique pilasters, they are established features of German Romanesque in the eleventh and twelfth centuries. Occasionally, however, the Classical caps and bases still appear, as at the east end of Mainz and the west end of Trier, both of the eleventh century. At the latter some of the carved caps are of Corinthian design.

Assuming that architectural influence of Germany on England which the connexion of the two countries renders probable, we can use the chronology thus gained for our own purposes. Many English examples of stripwork exhibit, not indeed classically shaped caps and bases, but rude blocks which are meant to do duty for such, and many others plain strips, with sometimes an indication of the arcading. We cannot suppose that our builders borrowed directly from Lorsch or other eighth-century examples a feature that was not taken up in the far more important Carolingian buildings of a generation later. It is reasonable to suppose that the borrowing would take place when the particular feature had become established in the region whence the influence proceeded, and we are directed in this way to the tenth century as the earliest date to which we can ascribe any of our buildings that show this feature, and this will practically mean the time of Edgar and Dunstan. A comparison between the stripwork on the north-west tower at Gernrode with that on the tower at Earls Barton will be instructive (see fig. 2). In both cases the pilaster caps

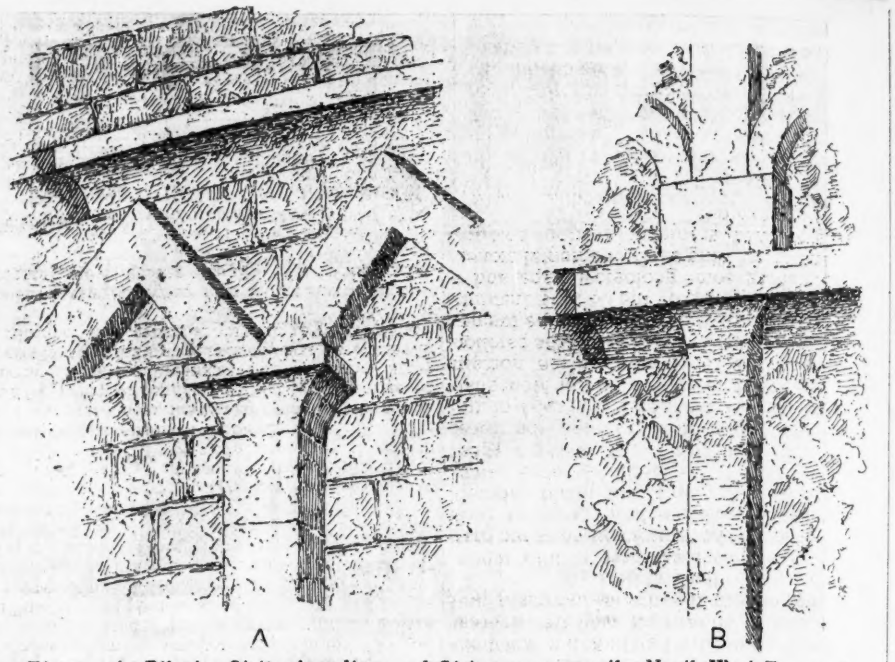


Fig. 2.—A. *Pilaster Strip, Arcading and String-course on the North-West Tower at Gernrode.* B. *Pilaster Strip and String-course at Earls Barton.*

and the string-course have a hollow chamfer. Such correspondence may seem a trifling matter, but trifles of the kind are often of considerable value in the settlement of architectural chronology. It may be pointed out that the peculiarly Anglo-Saxon plan of carrying a flat strip as a sort of frame round an opening is a refinement on the use of the upright pilaster. Any chronological inference which applies to the latter will be equally available for the "stripwork round openings."

II. *Windows.*—The double-splayed light in the form in which we are familiar

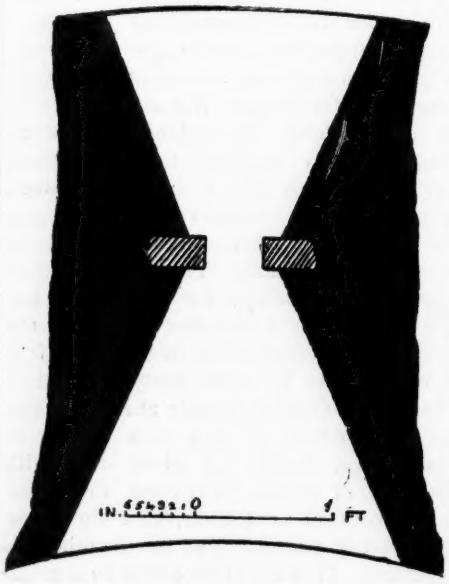


Fig. 3.—Double-splayed Light in the West Front of Trier.

with it, where the central aperture is comparatively narrow, is common enough in Early German Romanesque, but it would be hard to say where it first makes its appearance. The lower stage of the Rotunda at Fulda, of 820 A.D., possesses it, and if Adler is right the east end of the interesting little church of Niederzell, in Reichenau, has still earlier specimens. On the other hand, and this fact is of no little importance, there is nothing of the kind at Michelstadt. This basilica of about 827 A.D. possesses its original nave lights. They are of both the round-headed and the circular form, and are all internally splayed and furnished on the outside with a rebate for a shutter. The windows at Aachen, save some slits in the western flanking towers, are of the large-apertured Early Christian type. In the north flanking turret of the west front of St. Pantaleon, Cologne, there is an example from about 980 A.D. In the north wall of Bishop Meinwerk's Bartholomeus Kapelle at Paderborn of the early eleventh century is an original blocked double-splayed light, while in the west front of Trier, of about the middle of the century, they appear abundantly in a common Anglo-Saxon form (see fig. 3). Here again, the absence of the feature at Michelstadt seems to show that the doubled-splayed was not as early as the single-splayed window, and would lead us to date at least as late as the tenth century any example in our own country.

The shape of aperture in the ordinary internally-splayed windows with round heads is a matter to notice. In England, taking the Anglo-Saxon and Norman periods together, the apertures vary from those of comparatively broad proportions to narrow slits. Norman windows are sometimes very narrow. The smallest in the vaulted chancel at Darenth, Kent, measure 8 in. in width of aperture by a height of 2 ft. 1 in. In late Norman work they are much broader. The accepted early Anglo-Saxon churches which have internally-splayed lights—Monkwearmouth, west front; Jarrow, south side of present chancel; and Escomb—have them of broad proportions, and these appear also in the west wall of the nave of St. Martin, Canterbury, the technique of which suggests an early date. The aperture at Monkwearmouth was about 1 ft. 8 in. by 2 ft. 10 in. of height. This agrees with the German evidence, for the Michelstadt windows and those in the sister basilica at Seligenstadt are of broad proportions. It is true that tall narrow loops give light to the turret stairs in the west front at Aachen, but the imitation of arrow-slits in towers of defence is here the probable motive. On the whole, we should probably be right to regard narrow, internally-splayed lights in Pre-Conquest churches as decidedly late indications.

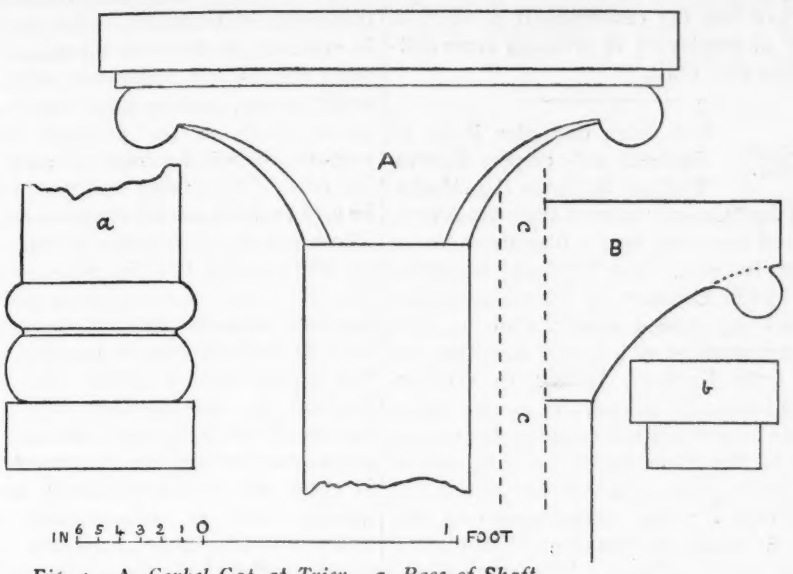


Fig. 4.—A. *Corbel Cap at Trier. a. Base of Shaft.*
B. *Corbel Cap at Sompting. b. Front View of Top of Cap.*
c. c. Grating that Fills in the Window Opening.

III. *Belfry and other Openings Divided by Mid-Wall Shafts.*—In connexion with this feature it is of special moment to test the theory of German influence, for what has been termed for brevity "mid-wall work" makes its appearance in Italy much earlier than beside the Rhine. If the pre-Conquest builders may have borrowed this directly from Italy there are no chronological data to be obtained from it. There is nothing, however in which the derivation from Germany seems more sure, for in the first place we find the feature in the vast majority of cases in the single western tower, the connexion of which with that region can hardly be doubted, and in the second there is a correspondence in details that is still more convincing. At Sompting, in the tower which carries a German "helm," we find in the south-west opening of the belfry stage a corbel cap that strikingly resembles a very common German form. The example from Trier, a sketch of which was given in fig. 1, p. 208 *ante*, is drawn to scale for comparison with the Sompting cap in fig. 4. The only difference is that the roll under the abacus is narrower in front view than the abacus. The base of the shaft at Trier is also quite familiar. Furthermore many of the cubical caps employed in our bell-towers of the Lincolnshire type can be matched pretty exactly in the numerous Romanesque towers in Germany. One of our most curious shapes, that in the western belfry opening at Glentworth, occurs at Gelnhausen and at Gernrode. The Scartho cap illustrated in the *Builder* of August 6, 1898, p. 118, fig. 8, is found, with the leaves rather more freely treated, in the oldest part of Werden a. d. Ruhr; the east cap at Glentworth, *ibid*, fig. 7, at Quedlinburg, &c.

The history of German "mid-wall work" is somewhat as follows. The Minster at Aachen introduced the large opening subdivided by columns after a fashion known in Roman times. The smaller aperture divided by a single shaft occurs in some subsidiary buildings thereto attached, and we find it again in the western part of the Minster at Essen, of the middle of the tenth century. It then becomes very common, especially in belfries, and in the matter of chronology may be regarded as in line with the *Lisenen* and the double-splayed window. It would not be safe to date any example of it in this country earlier than the epoch which seems to be indicated by the other evidence already passed in review. No building, in other words, that exhibits any of these three features can be safely placed earlier than the third period, opening with the reign of King Edgar, who, we are specially informed, "rebuilt and endowed churches."

Regarding now from this point of view the 170 Anglo-Saxon churches in the list published last autumn in the *Builder*, we find that the double-splayed window and the pilaster-strip or strip-work round openings) would exclude about fifty examples from any early period, and forty more would be rejected by the appearance or previous existence in them of the double openings with mid-wall shafts, so that n the evidence of these three criteria about ninety churches would be pronounced not earlier than the time of Edgar. There are about a score of others that without these special marks have indications of comparatively late date in the possession (or traces) of western towers, in advanced doorways or chancel arches, or in developed cruciform plans in which the side chapels have grown into complete transepts, as at St. Mary, Dover Castle.

This process of elimination leaves us with about sixty examples for which the above criteria are not available. Of these eleven constitute the acknowledged early list recorded at the opening of this paper, and nothing has transpired in the course of this survey to throw doubt on the received ascription. The only dubious feature is the great height of the nave walls at Monkwearmouth. The dozen might be rounded off by the inclusion, on the ground of its technique, of Stone-by-Faversham, though the late Mr. J. T. Irvine thought it a later fragment. Of the remaining half-hundred examples about a score present long-and-short work in quoins as sole indications of pre-Conquest date. These may be middle or late Saxon, but hardly early, for this quoining does not make its appearance on any of the first group.

Lastly, there is an interesting residuum of a couple of dozen examples, some mere fragments, about which there are no distinctive marks of either middle or late date, and which may, conceivably, therefore, go back to the earliest period. The principal of these are the following: St. Mildred at Canterbury, Stoke d'Abernon, Avebury, Somerford Keynes, St. Michael at St. Albans, Oxford Cathedral, Wroxeter, Heysham Church, Heysham Chapel, Bardsey porch, Sockburn, Hart, and Corbridge. St. Mildred has the big stones at the quoins, which as being in many cases Roman may have been used at an early date. It is a large building, but Brixworth in the seventh century was larger, and Canterbury is a place where ambitious efforts might be looked for. At Stoke d'Abernon the south wall of the nave, 2 ft. 7 in. thick, and part of the adjoining chancel wall claim attention. The technique is flint rubble, irregularly disposed in which are blocks of free stone, and on one of these is a projecting boss with the lines of a Saxon-looking sundial. This seems *in situ*, and its position over an old south door is normal. There are near it also the marks of an old flat-headed light like the one at Wroxeter. Nothing at Avebury seems incompatible with considerable antiquity, for the traces of long-and-short in the quoins are slight, and if, at St. Michael's, St. Albans, we assume the nave arcades to have been cut through pre-existing walls, these walls, with their internally-splayed lights, may be early. Oxford there is not space to discuss. The north wall of the present church at Wroxeter may be early Anglo-Saxon, for the square-headed opening can be paralleled at Escomb. Somerford Keynes should be taken in connexion with Heysham Chapel. The construction of the jambs of both doorways resembles that of the west door of the porch at Monkwearmouth and the chancel arch at Escomb, and the cable ornament on the head of the Wiltshire example may be of any date. The old north door of Heysham Parish Church is also of the same early form, but it must be admitted, on the other hand, that the jamb construction in question occurs also in later monuments, such as Earls Barton. Bardsey porch, if it existed before the tower, may be quite early, as it has the plan of Monkwearmouth and Corbridge, very thin walls and an internally-splayed light. Sockburn-on-Tees bears, in technique though not in proportions of plan, a resemblance to Escomb, and may be of the same generation. Hart, Durham, by the discovery of turned baluster-shafts like those at Monkwearmouth and Jarrow, seems to be linked with these acknowledged early examples. Finally, Corbridge, in virtue of its porch and Roman arch of entrance to the church, which has internally splayed windows, has a good claim to its place in the same rank accorded to it by northern antiquaries.

The intention of the foregoing remarks has been to call attention to some of the points that have to be considered in any attempt to form a chronology of Anglo-Saxon architecture. It makes no pretence to be more than a contribution to the work, in which so many are engaged, of building up some substantial knowledge of the earliest phase of English architecture. The list of examples offered recently is certainly far from an exhaustive one, and there may exist many buildings in the country that have as good a claim to a place on the early roll as these now noticed. Such a claim would, however, be barred by the appearance of any of the definite features that point to a more advanced epoch. There is no space here for any further attempt to distinguish subdivisions in the last and most

prolific period of the three adopted, or to suggest special criteria by which to identify works of the central or Danish period. We learn of St. Swithun, in the early part of this period, that he "gave great attention to the construction of churches in those places that were without them, as well as to the restoration of those that were ruined and broken down," and it is natural to seek for evidence of his activity in some existing monument. His diocese of Winchester included only Hampshire and Surrey, and had he gone over his borders he would have got into trouble with his brethren of Sherborne and Selsey. Of the Anglo-Saxon churches on the list in Hants and Surrey, Boarhunt, Corhampton, Headbourne Worthey, Hinton Ampner, Little Sombourne, Braemore, Guildford, Godalming, Stoke d'Abernon, all but the last two have pilaster strips, and on the evidence relied on in these papers cannot be of his time; still less, of course, of the time of Wilfrid. Godalming has been so much altered that a criticism is difficult, and at Stoke d'Abernon we have only a bit of walling without definite architectural features, though this may possibly be of his date. On the other hand, Somerford Keynes and Avebury, in the Sherborne diocese, have just the character that might fit them for this epoch. Avebury, in fact, with its suggestion of long-and-short and its single-splayed lights, would suit the Swithun period to a nicety, but it is unfortunately out of his beat.

NOTES.

Trade-Unions and the Taff Vale Case.

THE now celebrated Taff Vale case was, of course, the subject of discussion at the Trades Union Congress last week, and the fact that the House of Lords by their decision in that judgment have made trade-unions legally liable for the acts of their agents rendered necessary a consideration of the new position of these bodies. It was decided to take a test case to the House of Lords to ascertain how far picketing may be carried on without rendering the funds of a trade-union liable for damages. It seems, however, to have been overlooked that these questions of damages do not depend on pure questions of law. That which actually damages an employer is the strike, the cessation of work. But it is perfectly lawful for workmen to enter into combinations and to strike, and it is easy to think of a very flagrant case of picketing which may be unlawful, but which may at the same time be a legal wrong without carrying with it, under the circumstances, any right to damages; for an act of picketing would not be such as would carry with it damages unless some substantial loss could be proved to have flowed from it. We are inclined, indeed, to think that the Taff Vale case will have little effect on the funds of unions, because the very fact that an injunction may be obtained against a union in respect of the acts of its agents will have the effect of enabling employers to protect themselves before serious injury has accrued to them. So-called test cases are usually unsatisfactory and are frequently misleading, because when a real struggle arises the facts may be different, perhaps only slightly, but sufficient to render a decision in a previous "test" case inapplicable. We believe that trade-unions would be well advised merely to watch the action of employers and to keep a careful eye on this branch of law, the development of which in favour of employers is probably more difficult than they think.

Welbeck Abbey.

WE learn that the Duke of Portland will employ Messrs. Trollope & Co. for the rebuilding of the "Oxford" wing at Welbeck Abbey, rendered necessary by the disastrous fire in October last year. The "Oxford" wing was built by the Countess of Oxford (who also restored the ancient Gothic Hall in 1751) after the marriage of her only daughter and heir, Lady Margaret Harley, to William, second Duke of Portland. It is also stated that the new works will comprise the pulling down of the "tan gallop," a long arcade roofed with glass, of which the stones will be utilised for the reconstruction of the "Oxford" wing, and the site will be planted with an avenue of trees. The "tan gallop," with its east and west pavilions, is nearly 1,300 ft. long, and contains upwards of 64,000 ft. superficial of glass. It was erected for exercising the horses during the winter and on rainy days. The property derives its name from the abbey which was founded in King Stephen's day for Premonstratensian Canons of the Cistercian order by Thomas le Flemangh. At the Dissolution, when the revenues were computed as of the value of 298*l.* per annum, Henry VIII. gave a grant of the abbey to Richard Whalley, a wealthy clothier, who sold it to Sir Edward Osborne, of London, citizen and clothworker. From Osborne it passed, through some intermediate hands, to Sir Charles Cavendish, father of William, first Duke of Newcastle, who, in 1623, built the great riding house at Welbeck, which the late Duke of Portland altered and enlarged for a picture-gallery and chapel.

Tintern Abbey.

IT is satisfactory to know that Tintern Abbey has now been transferred by the Duke of Beaufort to a public trust, for, unless a private owner is very public-spirited and wealthy, historical or architectural monuments are less well cared for by private individuals than by some public or semi-public body. The surroundings of Tintern Abbey are not altogether satisfactory, and if, as we understand, some of the adjacent buildings are to be removed, it will be a distinct gain. The whole Abbey should also be carefully surveyed, not with a view to its restoration, but with the object of preventing further decay. Ivy is a picturesque addition to a ruin, but when allowed to grow in masses it has a bad habit of loosening mortar. A ruin so beautiful in itself and its surroundings as Tintern demands the most careful guardianship. It should never be forgotten that it is a ruin, but it should equally be borne in mind that it should be preserved as far as possible from further decay. Every information should also be given to the self-guiding visitor by hand cards, and the loquacious and parrot-like human guide should be prevented from troubling those who do not demand his services.

London Roadways.

IN a city like London, where the traffic is of so varied a character and where control is vested in a number of independent municipalities, it is not at all surprising that different methods of paving should be adopted. In many comparatively quiet thoroughfares macadam is still perpetuated in spite of its manifest disadvantages; in other streets and roads over which heavy traffic passes, granite setts remain in evidence; but in the principal highways asphalt and wood paving are predominant. Yet none of the paving systems in use can be said to fulfil all the essential conditions. These are necessarily of conflicting nature, for any material that is hard and unyielding, like granite, is resonant, and readily becomes smooth and slippery; another such as asphalt, that is compressible and has a fine surface affords practically no foothold in bad weather and becomes depressed in softer parts or flaked in harder parts; another again, such as wood, which is quiet and safe for animals, wears out quickly and is non-sanitary. Putting ordinary roadmaking materials into one category we find all the required characteristics, but the trouble is to combine them in any one form of material. Successful results reported from American and Continental cities cannot be obtained in London whose traffic is unapproached by that of any other place in the world. Moreover it must be remembered that the London omnibus carrying a very heavy load on extremely narrow wheels plays sad havoc with, and places a very unfair strain upon, any type of roadway. No doubt the enforcement of regulations by which the width of wheel tyres should be made proportionate to the maximum load, would vastly facilitate the work of municipal engineers, although such a policy would by no means constitute a solution of the problem presented. One step in this direction is recorded by Mr. Livingstone in a recent letter to the *Times*. Mr. Livingstone, who has had considerable experience of paving operations, directs attention to the "sanitary block" paving. Each block consists of Lake Trinidad bitumen mixed with small fragments of hard stone, the process of manufacture being performed at a temperature of 300 deg. Fahr., and the block is formed under a pressure of 125 tons. So far as our experience of this material extends, it undoubtedly combines most of the advantages possessed by asphalt and wood. It is non-absorbent, gives a good foothold in all weathers, and shows signs of considerable durability. On the latter point it should be said that the only sample subject to really heavy traffic, including omnibuses, has not been laid for a sufficient time to afford reliable data. The example in Carlos-place, which has been in use for four years without repair, shows no sign of wear, and the surface is fully equal to that of the adjoining wood pavement laid only two years ago in Mount-street. The effect of traffic seems to be that the blocks are slightly compressed and spread laterally, thus closing up the joints and making the surface even smoother than at first. Possibly the sanitary block system may not be of sufficient durability to stand exceptionally heavy traffic. That remains to be proved, but in the meantime it appears to be clear that the material is quite suitable for many roadways where neither wood nor asphalt is entirely free from disadvantage.

Australian Hard Woods.

A RECENT number of the "Bulletin of Miscellaneous Information," which is issued at irregular intervals from the Royal Botanic

Gardens, Kew, contains a Report of a good deal of interest by the late Mr. Ednie Brown, Conservator of Forests, on the Australian hard woods Jarrah and Karri, which are of much value for all kinds of out-of-door work. Of the Jarrah wood Mr. Brown states that—he is speaking of wood which had already been in use for sixty years—"it seems capable of standing wear and tear for another 100 years." Water seems to have no effect upon it. Of the Karri wood the Report says:—"For bridge planking, shafts, spokes, felloes, and large planking of any sort, flooring, general waggon work, beams, it is unequalled in this colony." The whole Report should, therefore, be carefully studied by those who are interested professionally in matters having to do with the construction of buildings, for it is open to doubt whether sufficient attention has been paid in this country to the Australian hard woods, and at the present time, when we hear so much of trade within the bounds of the Empire, it is desirable to use this feeling for the spread in the mother country of really sound commercial products.

Safety of the Brooklyn Bridge.

PUBLIC opinion in New York has been much agitated latterly by a comparatively small, but still sufficiently significant, mishap to the Brooklyn Suspension Bridge, and the alarm felt has been somewhat naturally increased by the fact that another failure occurred two or three years ago. When the bridge was opened for traffic in May, 1883, it afforded five passage-ways between the opposite sides of the East River: one footway, two cable-car tracks, and two carriage-ways. Since then two tracks for trolley-cars have been added, and there can be no reasonable doubt whatever that the structure has been loaded fully up to, and possibly beyond, the safe limit. Under such circumstances it is hardly fair to throw blame upon the original designers, although, in the light of more recent engineering experience, we may be able to see where some details of construction might be improved. Examples of bridge building such as the Newcastle High-level and the Menai Tubular bridges have neither developed faults nor signs of weakness under greatly-increased loads, but this happy circumstance may be traced in no small measure to the ample margin of strength which has always been allowed by British engineers. On the other side of the Atlantic the tendency has been, and still is, to regard the factor of safety with a certain amount of suspicion, as a thing that may conduce to waste of material if not carefully watched. The effect of this policy, as applied to bridge construction, is obviously to place a strict limit on any increase of load or variation of stress, but no such consideration appears to have entered the minds of those responsible for the safety of the Brooklyn bridge. It was bad enough to add nearly 50 per cent. to the original load, but it was much worse to admit to the additional roadways trolley-cars capable of powerful dynamical effect, and no one need be in the slightest degree surprised to hear of repeated failures. The first warning was given by the buckling of the stiffening trusses of the floor system, and the second by the breaking of nine suspenders by which the roadway is hung from the main cables. At the centre of the main span the trusses have slip joints, permitting a maximum longitudinal movement of about 7 in., and the cables also move, but in a vertical direction. Therefore the lower ends of the suspension rods move backward and forward as temperature varies. At the points of connexion, trunnion blocks are provided to which the rods are secured. Owing to inefficient action of the trunnions, largely due to want of proper supervision, a heavy bending strain has been brought upon the suspension rods, the strain being first in one direction and then in the other. Unfortunately these reverse strains were greatest at the centre of the span where the rods were shortest, and consequently possessed the minimum degree of flexibility, and the mischief was aggravated by the rusting of the screwed ends. The most extraordinary feature revealed in connexion with the present mishap is the inadequate nature of the supervision exercised by the responsible officials, and it is clear that in future a thorough system of inspection must be continually maintained. Some modification of structural details is also required to guard against the recurrence of failure. The main trusses should be made continuous across the centre of the span, and expansion joints might be formed at a short distance from each tower. Then no necessity would exist for hinged joints, as the great length and flexibility of the suspension rods would prevent the existence of injurious strains at the points of connexion.

High Speed Railways.

THE paper read last week at the International Engineering Congress at Glasgow by Mr. Lasche on high speed railways is a very important one. He describes fully the experiments on high speed electric cars which are being carried out at great expense by the Allgemeine Elektricitäts-Gesellschaft of Berlin. The details given are of great practical value to engineers. For example, liquid starting resistances have been found feasible, and this device will get over many difficulties. In the experimental line at the Berlin works the pressure used is 12,000 volts, but Mr. Lasche contemplates a pressure of 40,000 or 50,000 volts on the three-phase system. The speed for which the car has been constructed is 200 kilometres (124 miles) per hour. If this high speed is to be used on railways it will be absolutely necessary to have a separate track with lines in both directions for the express trains. The present system of signalling will also need altering, and crossings and switches will have to be abandoned. In the discussion Sir William Preece praised the way experiments were made in Germany, and complained that in England large sums of money were spent in trying to prevent experiments being made at all. He instanced the proposed electrical mono-rail between Liverpool and Manchester, and the costly opposition the promoters experienced in getting their Bill through Parliament. In our opinion, however, there would not have been so much opposition if the promoters could have referred to successful experiments. Professor Silvanus Thompson was of opinion that the conversion of railways from steam to electricity was the most important field of research for electricians at the present time. He deprecated the spending of a great deal of money in useless experiments like the one recently made at Earl's Court. He hoped that English manufacturers would equip practical research departments on the same lines as those in which the author had conducted his experiments. Professor Carhart mentioned that an entirely novel single-phase high-pressure system was shortly to be tried in Michigan, U.S.A. In this system, when the train pulled up, the motors would not be stopped, and hence the load on the line could be kept fairly constant.

Stained Glass.

MESSRS. POWELL & SONS have just completed a stained glass window which is on view at the Whitefriars Glass Works; besides its artistic treatment, the interest of this window lies in the fact that it is a German order and is going to the German church of Immanuelskirche, Frankfurt. The glass is of the mosaic treatment, similar to that done by Messrs. Powell & Sons at St. Paul's for Sir Wm. Richmond. This treatment was specially chosen by the donor in contradistinction to the Modern German style. The window will probably be regarded rather as a curiosity in Germany, but we hope it may draw favourable attention to a more rational treatment of glass decoration in that country. The scattered way that stained glass is nowadays introduced into churches makes it a difficult form of modern decoration to accept seriously. Sometimes the poetic completeness of the old Gothic churches is realised, but we fear they are too often disturbed by unsuitable innovations. In the case of a modern church the mosaic treatment has several advantages; one is the peculiar opalescent and jewel-like effect which is obtained and makes it suitable for concentrated decoration; it is also displayed to the best advantage among simple surroundings. We do not know whether its immense weight is likely to render it less durable from the "creeping" of the lead; for this reason, at any rate, it is probably undesirable for large windows such as those of the fourteenth or fifteenth centuries.

Stirling.

WHEN so many tourists are returning from holidays in the Highlands it is not untimely to suggest that those who are concerned with architecture should not pass Stirling by unvisited. This there is certainly a tendency to do, and it is not perhaps surprising, since it lies so closely on the border line of the Highlands that tourists are inclined to leave this town on one side and make either for Edinburgh or some Lowland place. The situation of the castle is remarkable, but what is more noticeable architecturally is the influence of French art. The house popularly called Argyle's Lodging, but once the home of Sir William Alexander, the poet, who was created Earl of Stirling in 1632, might have been transferred bodily from the banks of the Loire. The remains of the mansion known as Mars Work is as ornate as anything in Touraine, whilst the palace itself is distinctly reminiscent of France. No place more strikingly marks the connexion between Scotland and France before the Union, and there is something remarkable in seeing architecture which is so suitable to and so characteristic of the sunny climate of France struggling, so to speak, for existence in the uncongenial and stern atmosphere of Scotland. The Grey-

friars' Church equally shows traces of the same influence, so that a student who will spend a morning in Stirling will find matter for interesting and suggestive study.

THE RUSSIAN PAVILIONS AT THE GLASGOW EXHIBITION.

APART from the forestry exhibits, the portions of the Russian section which will prove of most interest to our readers are the buildings themselves. These are six in number, but two of them—devoted to flour and cereals—are very small, and need not be further referred to. The other four buildings are large wooden structures, built in the national style, garishly coloured, but undoubtedly picturesque, although to English eyes somewhat bizarre. They were all designed by Schechtel, a Moscow architect, and are worth careful study.

The building devoted to agriculture is perhaps the most important, and consists of a lofty nave about 11 yards wide, and two aisles, each about 7 yards wide, with large windows in the aisles and clearstory. The principal entrance is in the centre of one side, and two other entrances are provided in the extreme bays on the same side. The walls are painted—chiefly in pale green and salmon—and the shingles are coloured Indian red to imitate tiles. The forestry building consists of a lofty hall about 60 ft. wide with high-pitched roof having half-hipped gables, and has a verandah along one side, with a square tower rising from the end bay. The tower has a simple pyramidal roof, and forms (on the ground floor) a vestibule between the projecting porch and hall. The walls are painted light-brown and buff, and the shingles blue. The building devoted to mining industries is still more like a church, and has a nave and one aisle and an octagonal tower and spire masking the front end of the aisle; the shingles here are green. The most characteristic building of all is that devoted to miscellaneous exhibits. It is an ecclesiastical-looking structure on what is known as the central type of plan, and has an octagonal tower over the central area with tiers of sharply-pointed gablets and a lofty octagonal spire. The picturesqueness is increased by various annexes. The walls are salmon colour, and the shingles reddish brown.

It is not likely that the architectural details will be imitated in this country, but the construction of the roofs may serve as instructive types. That over the Agricultural Pavilion is roughly shown in figs. 1 and 2, which have been redrawn from rough sketches, and not from accurate measurements. The span of the nave is about 11 yds., and that of each aisle about 7 yds. The supporting posts measure 10 in. by 10 in., and are about 20 ft. apart. As shown in fig. 2, intermediate trusses are supported on cross timbers and struts midway between the posts. The dimensions of the various timbers forming the trusses are only approximate. The truss is of the hammer-beam type, each hammer-beam being composed of two pieces (about 9 in. by 2 in.) bolted to the foot of the principal rafter and to the sides of the raking strut. The common rafters are fixed horizontally, purlins being thus rendered unnecessary.

The roof over the Forestry Pavilion (figs. 3 and 4) is more peculiar, being a combination of the hammer-beam and scissor-beam types. The span is about 20 yds., and the framing is approximately as shown in the drawings. The main trusses (fig. 3) are about 17 ft. apart, and the intermediate trusses (fig. 4) are placed midway between them. The intermediate trusses are of the scissor-beam type, with a collar at one-third of the height. The main trusses are similar, but with long raking struts carried up from the posts to the ends of the collars. The raking struts are braced to the rafters and posts by two pairs of pieces measuring about 6 in. by 2 in. Iron straps are bolted to the timbers at the ends of the collars, and at the intersections of the scissor-beams on the king-post. At every other intersection, a single bolt is fixed. Each scissor-beam is composed of two pieces, about 9 in. by 2 in., one on each side of the main timbers.

The Forestry Pavilion contains by far the most interesting exhibits. They are all, or nearly all, supplied by the Imperial Appanages Ministry of Russia. These Appanages, by the way, were originally State lands, which were

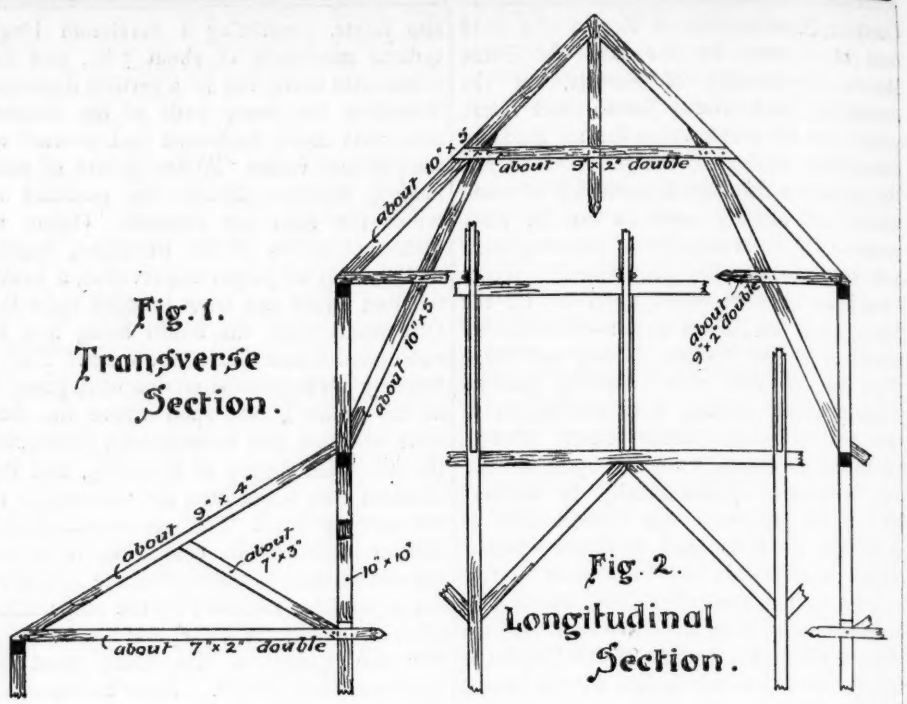
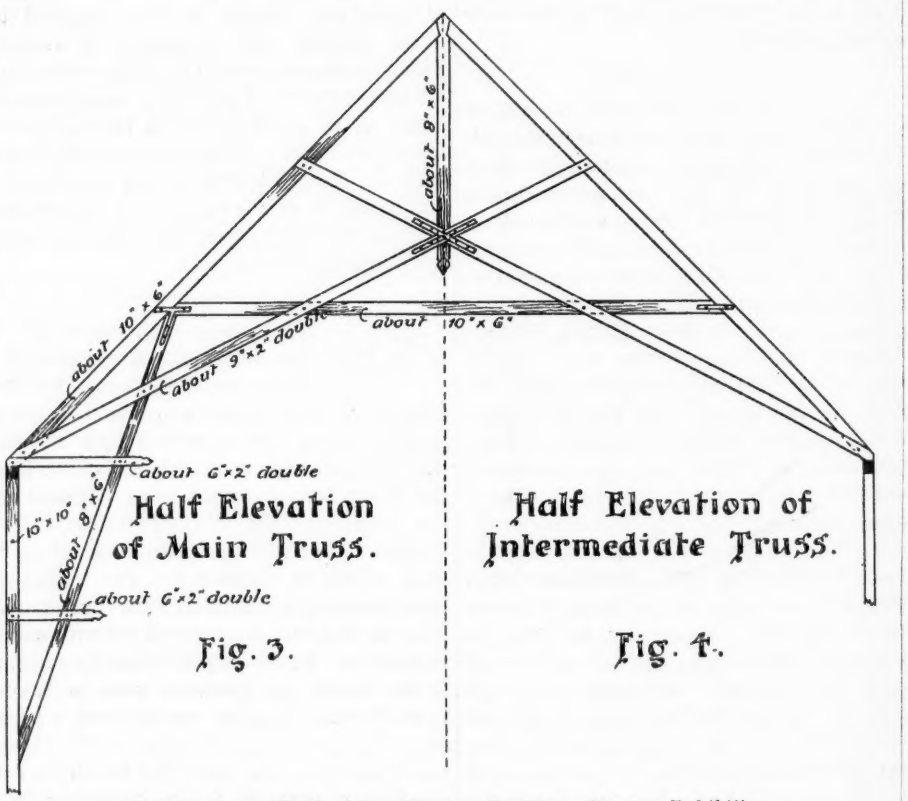


Fig. 1. Transverse Section.

Fig. 2. Longitudinal Section.



Half Elevation of Main Truss.

Fig. 3.

Half Elevation of Intermediate Truss.

Fig. 4.

Construction of Roofs of Two Russian Pavilions, Glasgow Exhibition.

set apart in 1797 by the Emperor Paul I. (who evidently knew what he was about) for the members of the Imperial family, other than the Emperor and his eldest son. The annual revenues have not always been spent, and the surpluses have been devoted to the development of the estates, and also to the purchase of new estates, so that at the present time the Appanages are very valuable properties, producing minerals, timber, vines, and cereals in great abundance. Some idea of their extent may be gathered from the fact that the area of the forests of the Appanages exceeds 150,000,000 acres. About two-thirds of this area is now under management. Regulations are made in order to preserve the forests from depletion. Each portion of a forest passes through a cycle of growth, cutting, and replanting, the duration of the cycle being regulated by the rate of growth in that particular district and other factors; thus, the "minima revolutions" for pine intended for the market is 160 years in the northern districts and 120 years in the southern. The cycles for firewood trees are much shorter, varying from about thirty to eighty years, according to the locality and the kind of tree.

Most of the timber is sold standing, the average price per deciatine (2·7 acres) being 94 roubles (9*l.* 16s. 0d.) in 1885, 99 roubles 10 copecks (10*l.* 5s. 6d.) in 1895, and no less than 134 roubles (13*l.* 19s. 0d.) in prosperous 1899. The net income from the forests was about 1,640,000 roubles in 1885, 1,900,000 in 1895, and 4,069,000 in 1898. Only about 10 per cent. of the annual production of the forests is converted in the saw-mills belonging to the Appanages, but the proportion is steadily increasing, as new saw-mills are being erected. At Archangel there is a saw-mill for the northern forests of Velsk; the forests of Vologda supply a saw-mill on the Kovja, a river of the Marie basin, whence the converted stuff passes to St. Petersburg or (for foreign markets) to the port of Kronstadt; the logs from the Nijni-Novgorod forests are floated down the Volga to the mill at Kaptarski; and another mill at Strablia serves the forest of Svislotchskaia. There is now a fifth mill at Astrakhan for converting the timber required in the Transcaspian districts. The mills at Archangel and on the Kovja are of more interest to English readers; of the output of that at Archangel from 1894 to 1898 inclusive, 70·7 per cent. was exported to England, the remainder going to Holland, France, Spain, Belgium, and Germany. Of the "pine and silver fir" (*i.e.*, red or yellow deal or fir, and white deal or spruce) exported from the mill on the Kovja, during the period 1897-9, about

60 per cent. was shipped to England, and about 27 per cent. to Germany.

A comparison of the woods grown in the different forests can be made by examining the 231 specimens collected in the two stands marked No. 7. The specimens are numbered, but unfortunately they are not placed in consecutive order, and it is, therefore, a difficult matter to find any particular number. The specimens are all 10½ in. long, but of various widths and thicknesses, and are polished on one side only. Fifteen different Appanages and Imperial estates are represented, ranging from Velsk and Vologda in the north to the forests adjoining the Black and Caspian Seas in the south. The soft woods, which are, of course, chiefly from the central and northern forests, include "common pine" (*Pinus sylvestris*), "silver fir" (*Picea excelsa*), "Siberian spruce fir" (*Abies sibirica*), and "Siberian larch" (*Larix sibirica*). Among the hard woods are oak, birches, alders, poplars, elms, sycamore and maples, willows, ash, linden, rowan-tree, palm-tree, apple and pear-tree, chestnut, hornbeam, box, hazel, fig-tree, walnut, holly, yew, almond-tree, and others. The student will find it interesting to compare the different varieties of the same species, as well as the different species.

Another series of exhibits (Nos. 8 to 53) is restricted to the timbers most commonly found in the forests, and important from the commercial point of view. The specimens in this series are about a yard long, and are cut from the lower parts of trees which have arrived at the age for exploitation. They are shaped as shown in fig. 5, one half of the face being polished, and include nearly all the common softwoods and hardwoods. In a third series (Nos. 54 to 66), confined to oak, aspen, and softwoods, the specimens are discs, a few inches thick, cut from the lower parts of tree trunks of large diameter; these specimens are "skied," and cannot be properly seen. Among the other exhibits are planks of various kinds of timber, oak stavewood, models of log rafts, &c. At Stand No. 199, which is not mentioned in the catalogue, are some fine unbarked logs of oak, pine, silver fir, and larch, about five yards long and 2 ft. in diameter, but some of the most interesting exhibits are the three series on the "defects and technical vices" of timber, as exemplified in the Velsk forests. The first series is numbered 159 (1 to 44), and deals only with common pine; the second series (No. 159, 45 to 73) is confined to silver fir; and the third (No. 159, 74 to 79) to larch. Thirty-four different names of defects are recognised in the sorting of timber at Velsk, but these may be classified in ten groups:—(1) Knotty wood, (2) rot, (3) curvatures, (4) rot at the foot, (5) clefts, (6) sunstroke, (7) recovered wounds, (8) soft wood, (9) irregularity of the structure, and deformity, (10) dead timber. As the specimens are not placed in consecutive order, it is difficult to follow them according to the catalogue, but the time taken in examining them will be well spent.

Fig. 5.

We have not by any means exhausted the exhibits in the Forestry Pavilion, but sufficient has been said to show that they are of great interest, not only to the timber-merchant and builder, but also to the architect.

In the other pavilions there is little which calls for notice. The exhibits in what we may call the miscellaneous pavilion consist of furs, carpets, trinkets, &c., and some inlaid cabinets and screens, which are, perhaps, more useful than beautiful, but this is not saying a great deal. In the agricultural pavilion the most interesting exhibits are the photographs of the ruins in the vast Imperial domain of Mourghab in Asia, and the relief map of the domain showing the system of irrigation. The pavilion devoted to mining industries contains twenty cases of minerals lent by the Mining Institute of St. Petersburg, some geological maps, and a large stand of building and ornamental stones, including polished granites of various colours, besides minor exhibits.

Undoubtedly the forestry pavilion is of most interest to our readers, and we recommend a study of the materials collected within its walls.

TRADES UNION CONGRESS.

THE fifth sitting of the Trades Union Congress was held on the 6th inst. in the Albert Hall, Swansea, Alderman C. W. Bowerman (London) presiding.

Mr. Fisher (Cardiff Coal Trimmers) moved a resolution re-endorsing the necessity for the extension of the principle of the Workmen's Compensation Act to all trades and occupations, abolition of the fourteen days' qualifying period, and that the basis of claim be fixed on the average wage per hour as representing a week's earnings, instead of the average week as at present; that appeals to the House of Lords be allowed against decisions of the Scotch Courts, that all workpeople be brought within the operations of the Act, that compensation be paid for all injuries sustained in the course of employment, that the 30 ft. limit as regards buildings, &c., be deleted from the Act, and also that the fourteen days' limit as regards liability be abolished, and that compensation be paid as from the date of the injury; that schedule 1B be amended, so that where total or partial incapacity for work results from the injury, a weekly payment shall be made during incapacity of not less than 50 per cent. of the recognised rate of wage of the trade or calling to which the injured person may belong, but in no case shall the compensation paid fall below 10s. per week for persons over eighteen years of age, young persons under the age of eighteen injured in the course of their employment to have their compensation fixed on prospective earnings; in no case shall a person who is in receipt of compensation be compelled to undertake any work other than that in which he was engaged when he met with the injury; also that the subsection as to serious and wilful misconduct of that workman be deleted, and emphatically protesting against the attempt now being made by the House of Lords to abolish the right of appeal to that body in cases of workmen's compensation in England. He said there were many limitations and restrictions to compensation paid under the Act which required to be swept away.

Mr. Markin (Liverpool Carpenters), who seconded the motion, dwelt upon the importance of the elimination of the 30-ft. limit to the workmen engaged in the building trade.

Mr. J. Holmes (Leicester Hosiery Federation) thought it inequitable to ask for the elimination of the serious and wilful misconduct clause. Supposing a man met with an accident when drunk, was the employer to pay him compensation?

Mr. John Ward (London Navvies) was surprised that workmen should have tacitly agreed to the 50 per cent. limitation of their claim for compensation for injury. It was a principle new to British law, and he hoped they would insist upon receiving compensation to the full amount of damage sustained.

Mr Edmund Browne (Standing Counsel to the Parliamentary Committee) said he had drafted a Bill to amend the Workmen's Compensation Act, which included the majority of the points in the resolution. The Bill aboilshed the fourteen days' limit, and the average wage per hour was also met. Mr. Ward's point was not in the Bill, but the Parliamentary Committee had no objection to altering the amount of compensation from 50 per cent. to the full wages. Casual labourers were now included, but the House of Lords had not yet decided how the wages were to be assessed. If a man had worked for however short a length of time his average weekly earnings could be very easily computed. It was one of the most extraordinary things in this most extraordinary Act that it entirely left out the right of appeal to Scotland. They had heard a lot about the House of Lords, but he was bound to say, so far as decisions under the Workmen's Compensation Act were concerned, they had been absolutely right, while the Court of Appeal had been absolutely wrong with reference to the clause asking the courts to estimate the prospective earnings of young persons who were permanently injured. He was of opinion that they ought to be reasonable in their demand. It was a very serious thing to ask any one to estimate what a young person of eighteen would be earning at twenty-five. With respect to the serious and wilful misconduct clause he felt Mr. Holmes was about the only person in the Congress who would leave it in the Bill. It was not so much a matter of suicide or of getting drunk, but if they once allowed an employer to raise the point of wilful and serious misconduct he would raise it as a defence in every action.

Mr. O'Grady (London Upholsterers) wished to know whether his amendment asking that the Compensation Act should be amended to cover all accidents sustained and sickness contracted through ill-ventilated and insanitary workshops, or arising from working at dangerous trades, was included in the draft Bill.

Mr. Browne stated that provision was made and compensation for illness arising from employment.

The resolution was carried.

Mr. W. Brace (Monmouth Miners) moved a resolution in favour of the amendment of the Miners Act by enforcing an eight-hour day for boy labour and colliery winners, and for securing improved working conditions in the mine. He said that in asking for the restriction of boy labour in mines to eight hours per day they were asking for a reform that Parliament ought to grant.

Mr. Carter (Castleford Colliery Enginemen) seconded the resolution, which was carried.

Mr. T. Smith (West Ham Gasworkers) moved a resolution in favour of a general eight-hour working day.

Mr. Honney (Fulham Shop Assistants) seconded the resolution, which was carried.

Mr. Albert Stanley (Cannock Chase Miners) proposed "That the Parliamentary Committee render all assistance possible to the Miners' Federation in pressing forward the Miners' Eight Hours Bill."

Mr. Walsh (Yorkshire Miners) seconded the resolution, which was carried.

The concluding sitting of the Congress was held on the 7th inst., Mr. Bowerman presided.

Mr. W. C. Steadman moved:—"That as the housing problem demands drastic solution, we, the organised workers, call upon the Government to amend parts one and eleven of the 1890 Act Amendment Bill, to make provision for dealing with the owners of unhealthy houses, to extend the time for repayment of loans to 100 years, and the establishment of fair rent courts. Further, that this congress thoroughly endorses the principles contained in the Bill promoted by the Workmen's National Housing Council, and introduced into Parliament by Dr. Macnamara, and demands of the Legislature that no time be lost in dealing with overcrowding and excessive rents. The congress further instructs the Parliamentary Committee to press the Government for facilities and support for the passing of this Bill in the next session of Parliament; and to take steps with a view to the amalgamation and concentration of labour forces on the housing question, not only for the purposes of legislation, but so that in any district where a slum or house famine exists the local authority shall take the necessary steps to provide proper accommodation at the cost of construction and maintenance." A good many people imagined that the whole of the 1890 Act was practically a Housing of the Working Classes Act. But parts one and two of the Act did not apply so much to housing schemes as to clearance schemes. In his experience of clearance schemes, it was impossible to rehouse on the site the same number of people as had been displaced. Municipalities put in force clauses 1 and 2 of the Act to clear away a slum district, but, unfortunately, under the present law they found it a very costly operation. In all clearance schemes they had got to compensate the owners of the property to the fullest extent unless they could prove to the Local Government Board that the area they were going to clear was an unhealthy one, when the owners of the property did not come within the Land Clauses Act. Apart from that one exception, it cost to put the Act into operation 80 per cent. more than it otherwise would do in adopting Clauses 1 and 2 of the Act. As the law gave municipalities power to prosecute a butcher or a fishmonger if he sold food unfit for human consumption, he contended that the same law should apply to the owner of slum property, and instead of compensating the slum-owner he should be prosecuted. The only land that was vacant to-day was agricultural land, and they could purchase that land for agricultural purposes for a very nominal amount. The County Council of Sussex purchased some land for 1*l.* per acre, but when they wanted land on which to build a lunatic asylum they had to pay 100*l.* per acre. He maintained that before they could solve in a practical manner the housing problem they had got to tackle the land question, and if the owner was going to demand more than agricultural value for his land when required for housing schemes, then he ought to be taxed now on the amount which he intended to ask as the value of the land.

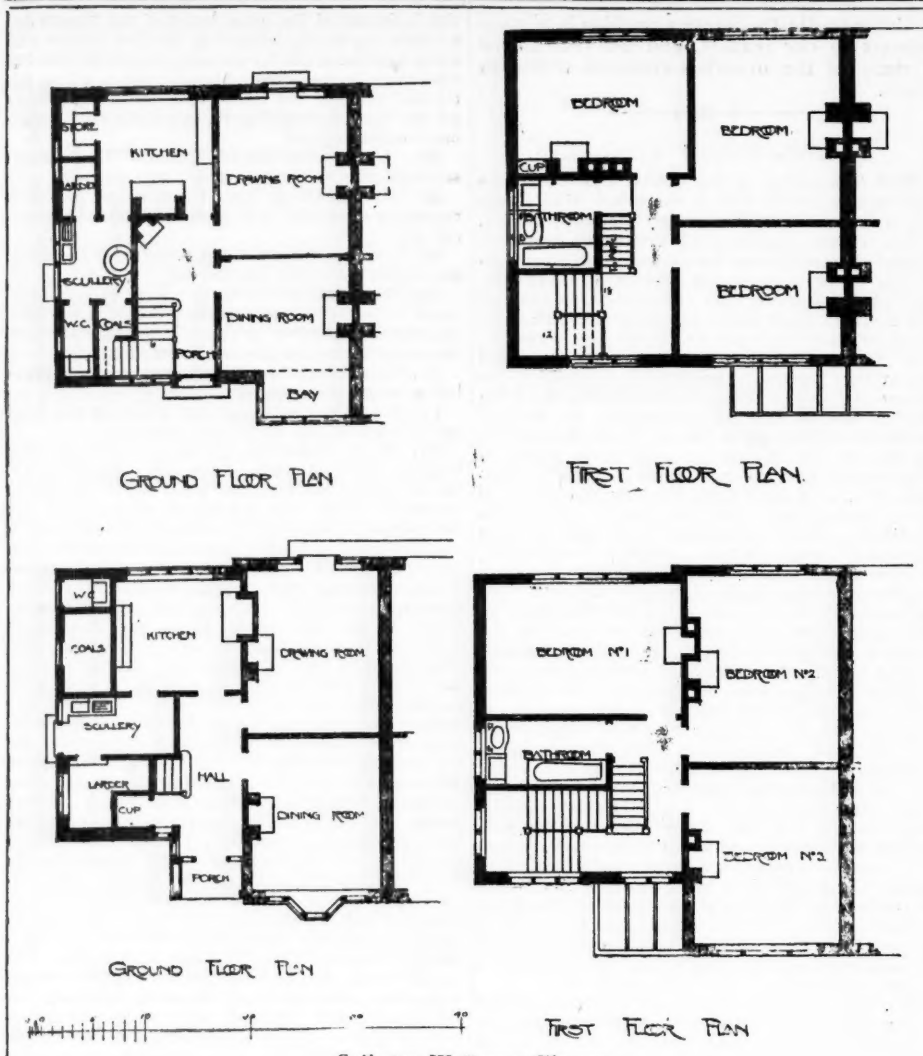
Mr. Walsh (London Tinplate Workers), who seconded the motion, said that for the first time they were asking a Parliamentary Committee to take this matter up with a view of securing local action for improving the housing of the working classes.

The resolution was carried unanimously.

Mr. E. C. Gibbs (London House Decorators) moved, "This congress, having in mind the importance of cheap transit as a means towards the solution of the housing problem, instructs the Parliamentary Committee to urge upon the Board of Trade the necessity of bringing pressure to bear upon the railway companies to strictly comply with the Cheap Trains Act, 1883, by issuing cheap tickets to all classes of workmen, and further to take such steps as may be necessary to cause all railway companies to issue third-class season tickets at the correspondingly cheap rates at which they now issue first and second class season tickets."

Mr. Cheeseman (London Fawcett Association) seconded the motion, which was agreed to.

CHURCH FOR LEA AND HOLLOWAY, SHEFFIELD.—It is proposed to erect a new church for the newly-created parish of Dethick, Lea, and Holloway. The architect is Mr. Percy H. Currey, of Derby, and the contractor, who has started work, is Mr. J. W. Wildgoose, of Matlock.



Cottages, Walton-on-Thames.

Illustrations.

"GLEBELANDS," WOKINGHAM.

THIS house, the illustration of which appeared in the Royal Academy Exhibition this year, is red and white. Messrs. Bottrill & Son, of Reading, were the builders; Messrs. Longden did the heating, &c.; Messrs. Wenham & Waters did the glazing and casements and the cast leadwork generally. Mr. Ernest Newton was the architect.

GRIMSTON COURT, YORK.

THIS house is in course of erection for Mr. J. J. Hunt on a fine site in the centre of his estate about three miles east of York. The site was laid out and planted some years ago for a smaller house, which somewhat restricted the arrangement of the present one.

The house will have fine views over the Plain of York, the Yorkshire Wolds, and the Vale of Derwent.

It is being built of 2-in. red Leicestershire bricks and Ketton stone, with oak for timbering. The works also include lodges, stables, electric light station, &c.

Mr. Anelay, of York and Doncaster, is the builder, and Mr. W. H. Brierley is the architect.

The drawing was in this year's Academy.

RUSSIAN PAVILIONS, GLASGOW EXHIBITION.

THE Wood Industries Pavilion and the Mining Pavilion which we illustrate are two of the Russian pavilions at the Glasgow Exhibition. An article on the Russian pavilions at the Exhibition will be found on another page of this issue.

ROADSIDE COTTAGES, WALTON-ON-THAMES.

THESE cottages are built very simply of local material, and quietly finished in every particular. Messrs. Niven & Wigglesworth are the architects.

DESIGN FOR A BILLIARD-ROOM.

THIS design is sufficiently explained by the drawing and the plan illustrated. It is the work of Mr. W. J. Tapper, architect.

COMPETITIONS.

INFANT SCHOOL, ST. ALBANS.—The local competition at St. Albans for the new infants' school at Garden Fields has resulted in the work being given to Messrs. Smee & Mence. Mr. S. Doddimeade Edmunds received the only premium awarded.

THERMAL WATER PUMP, BUXTON.—The first premiated design in the competition for thermal water pump, Buxton, was that by Mr. Gustave Agate, Pendleton, Manchester. The second premiated design was by Mr. C. Swain, Buxton, and the third by Messrs. Warren & Cargill, Matlock Bridge.

MUNICIPAL ENGINEERS AT GLASGOW.

THE Municipal Engineering Section, Section VII. of the International Congress of Engineering, was opened in the Engineering Lecture Theatre at the University, Glasgow, on Tuesday morning last week. The section was arranged by the Incorporated Association of Municipal and County Engineers, and the President (Mr. E. G. Mawbey, C.E., of Leicester) occupied the chair. There was a large and representative gathering of members of the Association present from all parts of the kingdom.

The President, in his inaugural address, said,—As representatives of that branch of engineering practice which is, perhaps, more closely identified than any other with the health of the people of the United Kingdom and our Colonies, it is fitting that we municipal engineers should take a duly prominent part in this International Congress, at what is possibly the greatest exhibition ever held away from London in the British Isles.

And I may here remark that it would have been difficult, if not impossible, to have selected a more suitable site for a great exhibition, and particularly for a congress of civil and sanitary engineers, than this city, which is the commercial capital of Scotland, the Manchester and Liverpool of the North, a seat of profound learning and a veritable hive of industry. Indeed, comprehensive as are the scope and character of the exhibition, it is doubtful whether it can convey more vividly and strikingly an adequate idea of the indomitable energy, pluck, skill, and enterprise of the British race than is conveyed by the great manufacturing works of Glasgow itself and the world-famed ship-building establishments and other gigantic centres of production on the Clyde; for a mere enumeration of the vast and varied industries so successfully carried on in this city and its environs would occupy much more time than I can devote to my brief address.

You will, however, I am sure, pardon me for alluding to one typical instance of the enterprise of the citizens of Glasgow. I feel that I must take this opportunity of congratulating the Civic Fathers of the city, who have been pioneers of British municipal tramways, upon the inception and completion of one of the most important tramway undertakings in the United Kingdom, and in these congratulations must be specially included Mr. Young, the eminent tramways general manager, and Mr. Clark, the able engineer. Even those of us who live at a remote distance from this city have watched with the keenest interest the progress of the undertaking, and if our admiration had not been voluntary it would have been compelled by the splendid way in which really phenomenal difficulties have been overcome as they have arisen. The principal characteristic of the scheme may be said to be that it is so thoroughly up-to-date in every particular, and it is evident that neither pains nor money have been spared to ensure complete success. The equipment of the Pinkston Power Station is especially interesting and instructive, for the plant includes both British and American engines of the highest types produced in their respective countries, and an unique opportunity is here afforded of judging of their relative merits when working under precisely identical conditions. I would strongly advise our members to take the fullest advantage of the facilities afforded for obtaining every possible information as to this grand undertaking and the admirable system of working and management.

Sewage Treatment.

Lieut.-Col. A. S. Jones, V.C., A.M.Inst.C.E., then read a paper on "Sewage Treatment." After a careful review of the numerous experiments in sewage treatment during the past thirty years, the author said it was almost a truism to say that in the matter of sewage disposal each locality required special plans and treatment, and he only pretended to put forward a few general conclusions. 1. In works of sewerage, limit and regulate as far as possible the volume of sewage by excluding sub-soil and clean surface water. 2. Interpose a narrow, deep catch pit or grit chamber at some convenient spot for taking clean heavy matter out of sewer, and then an iron screen (⅝-in. opening between bars) before the sewer discharges into the deepest part of tank large enough to hold two or more hours' flow. 3. The tank outlet should be over a level weir 1 in. below level of invert of sewer mouth, and as long as convenient; the floor of tank should slope up to this weir from deepest part under inlet of sewer. 4. Such a tank will be quite inoffensive for fifteen or twenty days, and be then nearly full of sludge, to be run off, if level permits, or pumped out. Or it can be left to act as a "septic tank" for six months or more, if it is desired to encourage anaërobic action, with its advantage of less sludge and drawback in offensive smell. 5. There is no practical difference, as regards the subsequent aërobic process, between the tank effluents resulting from the clean and the dirty alternative modes of working the depositing tank described in the last conclusion (4).

6. The essential point in the aërobic process, whether in land or "contact-bed," is sufficient aëration (excess, as by blowing, has no result commensurate with cost of its introduction), and it can be attained by intermittence of sewage and rest, or by continuous passage of sewage through a contact-bed kept always just moist in all its atoms by rain-like dropping on the surface so carefully adjusted as to moisten all parts, and not to form a water seal in any part of the bed. Intermittence is easily arranged on any scale of working, and continuous filtra-

tion, on the contrary, is difficult even for a few thousand gallons a day. 7. A low estimate for the construction of contact-bed may be taken as 5,000*l.** per acre, but 131 acres of land may often be purchased for that sum (at 38*l.* per acre), and we know that area of land, at Aldershot, to have dealt with about 1,000,000 gallons of sewage a day for nearly forty years, and to be more efficient than ever, while Mr. Dibdin's formula, "one acre of contact-bed to 1,000,000 gallons a day," has been cut down by most of his disciples to 500,000 or 250,000 gallons, and we have yet to learn what the fate of such bed will be ten years hence. The heavy first outlay of capital for land purchase often deters Councils from a freehold investment which must be of great value to a future generation, and leads them into hand-to-mouth expedients which will leave little or no asset when the sewage problem has at last to be faced in real earnest. Since the paper was written the interim Report of Lord Iddesleigh's Royal Commission had been published, and he could not send it to press without adding an expression of his satisfaction with the conclusions set forth by that authority. Land therein evidently held its position as the only natural process, and all other modes of sewage treatment were conveniently classified together as "the artificial processes." They were assured that the latter were in the experimental stage, and were promised a continuance of the careful examination commenced three years ago of the problems involved "which are so many and varied that only investigation and, we may add, experience of a prolonged and varied character will suffice to solve them."

Mr. K. F. Campbell, M.Inst.C.E., Huddersfield, contributed a paper on "Researches into the System of Sewage Purification at Huddersfield by Bacterial and other Methods." The staple trade of Huddersfield is woollen, the waste from which contains fat, soaps, dyes, and a variety of chemicals used chiefly in the dyeing and finishing of the goods, resulting in a highly-coloured soapy liquid. The dry-weather flow of sewage contains 30 per cent. of trade waste, of which but a very small proportion is derived from other than the woollen industries. For a number of years a portion of the sewage was purified by means of chemical precipitation and subsequent filtration through beds composed to a great extent of sand. These, however, rapidly became clogged, and although elaborate provision was made for the cleansing of the filtering material by upward washing, it became impossible thoroughly to do so unless removed from the beds, and as this would have been of frequent occurrence the process was abandoned, the cost of working being already prohibitive. Attention was then directed to the more modern systems of sewage purification, and experiments have since been conducted with three methods, which are as follows:—1. The treatment of the raw sewage in contact-beds. 2. The purification of the effluent produced by chemical treatment in contact-beds. 3. The treatment of the sewage in an open septic tank and contact-beds. The following table shows the loss of capacity of various beds at Huddersfield, and also the period they had been in operation:—

—	Initial Capacity (gallons).	Latest Capacity (gallons).	Loss of Capacity (per cent.).	Period (weeks).
Rough contact-bed, treating crude sewage	19,000	4,800	75	76
No. 7 bed, treating chemically-treated sewage ..	19,230	11,425	41	110
No. 10 bed, ditto	19,940	9,763	51	142
No. 12 bed, ditto	19,200	8,829	54	134
No. 15 bed, ditto	18,072	11,425	37	68
Rough contact-bed, treating septic effluent.....	3,990	2,030	49	34

After the above observations were taken the rough contact-bed treating septic effluent was allowed to rest one month, during which its capacity increased to 2,560 gallons (36 per cent. of original); after five days' working and the tenth filling the capacity decreased to 2,220 gallons (45 per cent. of original); and after a fortnight to 2,130 gallons (47 per cent. of the original capacity). The author, after three years' careful investigation of the subject, has arrived at the following conclusions:—1. That by no process can the formation of sludge be obviated. 2. When the crude sewage is treated in contact-beds the rapid accumulation of matter in the beds renders the process impracticable. 3. That by the use of a small quantity of lime and copperas, followed by contact-bed treatment, a satisfactory effluent can be produced. 4. That the contact-beds used for the purification of the effluent after chemical precipitation will not retain their capacity indefinitely, and that in the course of a number of years it will be reduced to such an extent as to render necessary the washing or riddling of the material. 5. That by the open septic process about 40 per cent. of the sludge is destroyed. 6. The septic effluent is not as amenable to subsequent contact-bed treatment as the effluent from chemical precipitation. 7. The capacity of the beds treating the septic effluent decreases more rapidly than that of the beds treating the effluent after chemical precipitation owing to the excessive amount of suspended matter in the septic effluent. 8. The septic effluent after double contact is frequently unsatisfactory. The results obtained tended to show that the sewage problem is one which, even to-day, requires further investigation on the part of the engineer and chemist before the hidden mysteries in connexion with it are properly solved and accepted in practice.

Mr. Fowler, London, moved a vote of thanks to the authors of the papers, and said the delicate process of bacteriological treatment must really come to nothing if they had not an efficient manager to carry out properly the engineer's design. He suggested that the filtering material in the coarse contact-beds should be of bricks, finished off with clinkers and cinders; and he was in favour of a periodical cleaning of the filtering material.

Mr. Midgley Taylor, Westminster, who seconded, predicted that any experimental works put up for bacterial treatment of sewage would be a failure unless they dealt with the whole of the area, thus rendering it possible to obtain a true sample of the sewage to be treated. The question of cleaning bacterial beds had been closely gone into by him, and he calculated that it cost something between 200*l.* and 300*l.* per annum per acre to keep a bacterial contact-bed in order. This annual expense was very much lost sight of by engineers recommending authorities to put in bacterial installations.

Mr. A. J. Martin, Exeter, said the results which Colonel Jones had obtained with land treatment at Wrexham and Aldershot entitled his opinions on the subject to a great deal of respect, and the results which Mr. Mawbey had obtained at Leicester also showed what could be done with land treatment. Possibly the weakest point in connexion with land treatment was that it laid itself open more than any other system to being tampered with in the supposed interest of the rates. Colonel Jones had slightly misrepresented Mr. Cameron's septic-tank system. The great object of the septic tank was to exclude the atmosphere and to preserve an equable temperature in the lower layers of the tank.

Mr. J. Price, Birmingham, said the detritus tank was an absolute necessity of the septic system in Birmingham. Colonel Jones was consistent in having always advocated the land, and he thought he was right. Fortunately, at Birmingham they had been able to get a sufficient area of land up to the present to deal with their sewage, but the next twenty years might force them either to go to a larger area or to bacterial treatment.

Mr. S. Platt, Rochdale, admitted that sludge could not be entirely removed, but it could be to a very great extent reduced. He had been experimentally dealing with 200,000 gallons per day, and the sludge was 2 ft. deep in the tanks after two years' working, a quantity which would be obtained in a week's work by the ordinary precipitation process.

Mr. T. Stewart, Cape Town, who claimed to be the first to introduce the bacterial treatment in South Africa, gave some particulars of the working there.

Mr. Corbett, Salford, said that in beds filled with sprinklers and used practically continuously for five years he had found no deterioration whatever. They had no difficulty with sludge. They disposed of it at 8d. per ton, sending it to sea by way of the Ship Canal.

The vote of thanks having been agreed to,

The President said it was too late to discuss the question of bacterial treatment versus land. They had proved beyond doubt that they could satisfactorily deal with the sewage of manufacturing towns, as well as domestic sewage, by bacterial treatment. But his own idea was that where they had excellent land available, and plenty of it, at reasonable cost the time had not come to disregard such an opportunity and go in recklessly for bacterial treatment. If they had job land at their doors the proper thing was to make the best use of it, and supplement it by bacterial methods where land in sufficient quantity could not be obtained.

Water Supply Works for Birmingham.

The sitting was resumed on the 4th inst. under the presidency of Mr. E. G. Mawbey, C.E., when Mr. Mansergh, C.E., President of the Institution of Civil Engineers, delivered a lecture on the works which are now in progress in the Elan Valley for supplying water to the city of Birmingham. Having explained that the present daily water needs of Birmingham were 18 or 19 million gallons, which in the present dry season rose to 24 million gallons a day, Mr. Mansergh said the source of the new supply was the river Elan, a tributary of the Wye. The distance from the lowest reservoir to the centre of Birmingham was eighty miles, divided pretty equally between tunnel, cut and cover, on the one hand, and iron and steel pipes crossing valleys. Mr. Mansergh then showed by means of lantern slides the position of Birmingham and the Elan watershed, Manchester and Thirlmere, Liverpool and Vyrnwy, and the scheme which Sir Alexander Binnie has suggested for London. The mean rainfall on the watershed was 68 in., rising to 94 in. in years of heavy rainfall and falling to 44 in. in times of drought. The reservoir at Caban Coch, with the submerged dam, was then shown on the screen, Mr. Mansergh stating that from this reservoir they expected to get 27 million gallons of water a day and to send down the stream a further 27 million gallons as compensation water. Mr. Mansergh next showed by slides the means by which the flood water was dealt with during construction, and followed this with an interesting description of the village built to accommodate the workmen. It contains about 1,200 people, with schools, recreation-hall, wash-houses, and hospitals. One of the hospitals was intended for infectious diseases, but was not used much on account of the precautions to keep out smallpox and typhoid. There was also a doss-house, in which all men who came on tramp had to go for a week. They were put in quarantine, in fact, under the supervision of the doctor. They had also to have a bath, and were given a clean nightshirt. This had proved most useful in keeping the village free from infectious disease. The canteen-keeper had no interest in the sale of beer, and the Corporation was able to make 1,500*l.* a year, which was being spent for the benefit of the men employed upon the works.

Mr. Harpur, Cardiff, moved a hearty vote of thanks to Mr. Mansergh for his lecture. He did so with great pleasure as a frequent visitor to the works, and one who had considerable knowledge of the district. He considered the works to be the finest of the kind which up to the present had been attempted.

Mr. W. Weaver, Kensington, seconded the vote of thanks, which was accorded with acclamation.

Municipal Sanitation.

Mr. W. Weaver, Kensington, then read a paper on "Municipal Sanitation." He said, included in the duties of a municipal authority, those appertaining to sanitation ranked as most important, inasmuch as upon their efficient discharge the health and comfort of the community to a very large extent depended. House drainage, as far as consistent with efficiency, should be made as simple as possible. Complication necessitated extra expense, and this, with other details of sanitary administration, meant extra rent. It could not be disputed that sanitary inspection had been an active factor in bringing about the present difficulty of making house-room too expensive for the poor. Water, like air, was a necessity of life, and both should be pure, free, and unstinted. The two latter qualifications might be unattainable, but there should be no question as to the purity, and only by municipal ownership could there be any future chance for a free and unstinted water supply. Most of the provincial towns own their respective water supplies, but in London, where the supply, pure and efficient, was in the hands of private enterprise, many inconveniences were inflicted upon

* Such beds at Salford and Birmingham cost 10,000*l.* and upwards per acre.

the consumers, arising to a large extent from the somewhat absolute statutory powers conferred upon the companies, and the manner in which those powers were exercised. Quite recently, at enormous trouble and expense, the Metropolitan authorities had had to make a determined stand (fortunately with success) against the water companies, who were submitting for State approval by-laws dealing with water supply and fittings. Although the London County Council, innocently or otherwise, had interpreted the storm of indignation thus aroused with regard to the fittings as having been directed against the supply, it could not be gainsaid that whatever arguments (and they were many) might be urged in favour of the Metropolitan water companies, it remained a sound principle that a vital public necessity such as water should not be left to the supply and control of private enterprise for purposes of profit. With reference to sanitary administration, one of the great difficulties arose from inability to enforce cleanly and sanitary habits on the occupiers. Some slight remedial effort in this direction had been made within the past two years by the passing of the Verminous Persons Act, but the practical application of the measure was extremely limited owing to its inherent difficulties.

Subject to wise use, the power to acquire land generally would be a great boon, if conferred on Local Authorities, instead of being, as at present, restricted to special Acts for special purposes. If each municipality owned the site of its town and its environs, the enhancement of the value of the latter by the work and prosperity of the former would form a valuable corporation asset in reduction of rates, and corporation land stock would form a popular and profitable investment for the savings of the inhabitants, encouraging local energy and habits of thrift. Main paved streets should be thoroughly washed at night and the solids prevented from passing into the sewers, unless the latter were large with a good flow to outlet independent of pumping. Machine brooms should thoroughly sweep the surface whilst saturated, leaving the refuse in ridges about 2 ft. from kerbs. Such refuse after draining should be heaped and picked up in the early morning. By following this system of cleansing, the surface water flushed the sewers during their minimum flow, and only comparatively solid refuse had to be carted away—an economical consideration. The prompt and regular removal and sanitary disposal of towns' refuse was an imperative necessity.

Mr. Macdonald, Glasgow, also contributed a paper on the disposal of sewage.

Mr. Midgley Taylor, Westminster, moved a vote of thanks to the authors of the paper.

Mr. George Chatterton, Westminster, seconded. The vote of thanks was accorded unanimously and briefly acknowledged.

The meeting then adjourned.

APPLICATIONS UNDER THE 1894 BUILDING ACT.

AT the meeting of the Building Act Committee of the London County Council, held on the 29th ult., the proceedings were governed by the clause in the Order of Reference which empowers the Committee at certain seasons to act on behalf of the Council in relation to matters included in the Order of Reference. Those applications to which consent has been given are granted on certain conditions. Names of applicants are given in brackets. Buildings are new erections unless otherwise stated :—

Lines of Frontage and Projections.

Fulham.—That the application of Messrs. Flew & Co. for an extension of the period within which the erection of one-story shops on part of the forecourts of Nos. 83, 85, and 87, North-end-road, and No. 1, Beaumont-crescent, Fulham, and the erection of a block of flats with one-story shops in front, on a site between No. 83, North-end-road and Beaumont-mansions were required to be completed, be granted.—Agreed.

Bermondsey.—That the application of Mr. A. Murray for an extension of the period within which the erection of buildings on the site of Nos. 73 to 101 (odd numbers only), inclusive, Old Kent-road, Southwark, was required to be completed, be granted.—Agreed.

Clapham.—Buildings on the south side of Clapham Park-road, Clapham, to abut upon Park Hill (the Council of the Metropolitan Borough of Wandsworth).—Consent.

Clapham.—A school building on the site of Nos. 62 and 63, Clapham Common South-side (Mr. J. O. Smith for the Girls' Public Day School Company, Limited).—Consent.

Deptford.—The retention of a newspaper stall and book stands in front of No. 151, New Cross-road, Deptford (Mr. J. H. Waterworth for Mr. F. Hulbert).—Consent.

Finsbury, Central.—That the application of Mr. T. H. Watson on behalf of Capt. F. T. Penton, for an extension of the periods within which the rebuilding of Nos. 2 to 5 inclusive, White Lion-street, Pentonville, was required to be commenced and completed, be granted.—Agreed.

Hammersmith.—Three houses in the north-west side of Dalling-road and four houses on the north side of Wellesley-avenue, Hammersmith (Mr. G. Trotman for Mr. W. Hide).—Consent.

Hampstead.—Bay windows to twelve houses on the south side and eight houses on the north side of Hollycroft-avenue, Hampstead (Mr. W. J. King).—Consent.

Kennington.—A one-story addition at the rear of No. 71, The Grove, Harleyford-road, Vauxhall (Mr. W. Head).—Consent.

Lewisham.—That the application of Mr. E. C. Christmas for an extension of the period within which the erection of houses, with bay windows and shops, on the site of Nos. 49 and 51, Dartmouth-road, Forest-hill, was required to be completed, be granted.—Agreed.

Lewisham.—Three one-story shops on the north side of Stanstead-road, Forest-hill, westward of No. 129 (Mr. R. E. Crossland for Mr. E. Paul).—Consent.

Lewisham.—The retention of the dwelling-houses numbered 335, 337, 339, and 341, with one-story shops in front, on the east side of Brockley-road, Lewisham (Mr. E. Tompkins for Mr. G. Lawrence).—Consent.

Lewisham.—Wood and tile pents over the entrances to a pair of semi-detached houses on the north side of Micheldever-road, Lee, westward of No. 8 (Mr. J. S. Blunt for Mr. W. Marsden).—Consent.

Peckham.—Four houses, with one-story shops, on the site of Nos. 194, 196, and 198, Rye-lane, Peckham (Mr. T. Wilkins for Mr. W. Wilson).—Consent.

Woolwich.—The retention of an addition to a coachhouse and stabling at the rear of No. 23, High-street, Plumstead, abutting on Reidhaven-road (Mr. H. O. Thomas for Mr. J. J. Messent).—Consent.

Haggerston.—Iron and steel balconies at the first, second, and third floor levels in front of the new wing to the North-Eastern Hospital, on the north side of Hackney-road, Bethnal Green (Messrs. Marshall & Vickers for the Committee of Management of the North-Eastern Hospital).—Consent.

Strand.—Two iron and glass shelters at the entrances to an extension of the Trocadero Restaurant, Shaftesbury-avenue, Piccadilly-circus (Mr. G. W. Booth for Messrs. J. Lyons & Co., Limited).—Refused.

Greenwich.—One-story shop fronts to thirteen proposed houses on the north side of Woolwich-road, Greenwich, between Nos. 461 and 491 (Mr. T. N. Dinwiddy for Mr. T. Dinwiddy).—Refused.

Hackney, South.—The retention of a one-story shop front to No. 121, Daubeney-road, Hackney (Messrs. Lamb, Son, & Prance for Mr. G. T. Poole).—Refused.

Islington, North.—A one-story addition on the north side of No. 122, Dartmouth Park Hill, Islington, to abut upon Langdon-road (Mr. R. Midworth for Mr. F. Bryen).—Refused.

Kensington, South.—A one-story addition at the rear of No. 67, Marloes-road, Kensington, to abut upon Scarsdale Villas (Messrs. J. Surrey & Son for Mrs. M. Surrey).—Refused.

Kensington, South.—A two-story building on the south side of No. 7, Cathcart-road, Kensington (Messrs. Law & Allen for Mrs. E. Ward).—Refused.

Marylebone, West.—A one-story porch on the north side of No. 33, Montagu-square, to abut upon Montagu-place (Mr. F. W. Foster).—Refused.

Norwood.—A school building and additions to the clergy-house at the rear of Corpus Christi Church, Brixton-road, Brixton, to abut upon Horsford-road and Trent-road (Mr. J. F. Bentley for the Right Rev. F. Bourne).—Refused.

St. George, Hanover-square.—An addition to the one-story shop in front of No. 225, Regent-street, St. George, Hanover-square (Messrs. H. G. Lancaster & Co., for the Orchestrelle Company).—Refused.

St. George, Hanover-square.—An iron and glass verandah at the first floor level in front of No. 9, Queen-street, Mayfair (Messrs. Spillman & Co.).—Refused.

Strand.—A projecting lamp and iron sign in front of Nos. 7 and 8, Rupert-street, St. James's (Mr. C. Manzie).—Refused.

Woolwich.—A one-story addition at the rear of No. 8A, High-street, Plumstead, to abut upon Mineral-street (Mr. A. L. Guy, for Messrs. Pearks, Gunston & Tee, Ltd.)—Refused.

Width of Way.

Bermondsey.—A one-story shop addition to No. 2, Millstream-road, Dockhead, Bermondsey (Mr. J. A. Stayner).—Consent.

Deptford.—That the application of Messrs. Douglas Young & Co., for an extension of the periods within which the erection of three two-story houses with shops on the east side of Watergate-street, Deptford, at the corner of Trevithick-street, was required to be commenced and completed, be granted.—Agreed.

Fulham.—The retention of an addition to a laundry building on the south side of Garden-row, Fulham-road, with the forecourt fence at less than the prescribed distance from the centre of that street (Mr. A. Howard for Mr. A. Chubb).—Consent.

Hackney, South.—The rebuilding of Nos. 56, 58, and 60, High-street, and No. 1, Bridge-street, Homerton, at less than the prescribed distance from the centre of Bridge-street (Mr. J. Hamilton for Mr. W. E. Stevens).—Consent.

Hampstead.—Two one-story additions to the George public-house, No. 210, Haverstock-hill, Hampstead, with the boundary fence at less than the prescribed distance from the centre of the roadway leading from Haverstock Hill to the North-Western Fever Hospital (Mr. D. W. Crawford for Messrs. W. Younger & Co., Limited).—Consent.

Lambeth, North.—An additional story on the one-story addition at the side of No. 10, Juxon-street, Lambeth-walk, Lambeth (Mr. F. A. Powell for Mr. A. Wyatt).—Consent.

Peckham.—A laundry building and a house at the rear of Nos. 881, 883, and 885, Old Kent-road, Peckham, with the forecourt boundary at less than the prescribed distance from the centre of Wagner-street (Mr. E. Crosse for Mr. F. Cole).—Consent.

Rotherhithe.—A church and a clergy-house on the south side of Paradise-street, Rotherhithe (Mr. F. W. Taskar for the Rev. Canon St. John).—Consent.

Whitechapel.—A building and a boundary-fence at less than the prescribed distance from the centre of Vine-court, Whitechapel-road, Whitechapel (Mr. J. R. Smith for Mr. A. W. Brown).—Consent.

Whitechapel.—A slaughter-house, boiler-house, and chimney-shaft on the south side of Winthorp-street, Whitechapel, westward of Nelson-court, with the boundary-fence at less than the prescribed distance from the centre of the street (Mr. A. Roe for Messrs. Harrison, Barber, & Co., Limited).—Consent.

Deptford.—Two houses at the rear of Nos. 45, 47, and 49, Kender-street, New Cross, and the rebuilding of two houses on the east side of Kender-street, southward of No. 49, at less than the prescribed distance from the centre of a passage-way leading to Esther-cottages (Mr. J. H. Waterworth for Mr. W. Falkner).—Refused.

Space at Rear.

Islington, North.—A modification of the provisions of Section 41 with regard to open spaces about buildings, so far as relates to the proposed erection of an addition to No. 6, Ebury-street, Junction-road, Islington, with an irregular open space at the rear (Mr. J. D. Hunter for Mr. F. Cousins).—Consent.

St. George, Hanover-square.—A further deviation from the plans approved on July 31, 1899, under Section 41 (1) (vi.) of the Act, for the erection of a block of residential flats on the site of No. 25, Hanover-square, at the corner of George-street, St. George, Hanover-square, with an irregular open space at the rear, so far as relates to the erection of an addition at the ground floor level at the rear of the premises (Messrs. C. Bell, Withers, & Meredith for Mr. G. H. Schofield).—Consent.

Width of Way, Lines of Frontage, and Projections.

Westminster.—An iron and glass shelter at the Westminster Fire Brigade Station, Francis-street, Howick-place, Westminster (Mr. O. Fleming for the Fire Brigade Committee of the Council).—Consent.

Holborn.—An iron and glass hood over the entrance to the Caledonian Temperance Hotel, No. 5, Harpur-street, Theobald's-road, Holborn (Mr. J. A. Tregelles for Mrs. M. F. Anderson).—Refused.

Kensington, South.—An addition to consist of a projecting wooden frame and doorway in front of No. 2, Cranley-mews, South Kensington (Mr. M. King for Mr. J. D. Hill).—Refused.

Woolwich.—Five houses on the north-west side of Red Lion-lane, Shooter's Hill, Woolwich (Mr. A. E. Parnell for Mr. J. Sanford).—Refused.

City.—An oriel window at the first, second, third, fourth, and fifth floor levels of the Saracen's Head Hotel, Snow Hill, City, to abut on King-street (Messrs. Wilkinson & Parker for Mr. F. Dreage).—Refused.

Width of Way and Space at Rear.

Woolwich.—Three houses on the west side of Barnfield-road, Plumstead, at the corner of a roadway leading from Barnfield-road to Princes-road (Mr. H. Roe for Mr. W. Sutch).—Consent.

Lines of Frontage and Construction.

Hackney, South.—An iron and glass covered-way in front of Nos. 8 and 10, Southwold-road, Hackney, to connect the basement entrances of those premises (Mr. J. Hamilton for the executors of the late Mr. C. Butters).—Consent.

Islington, North.—A wood and glass photographic show-case on the forecourt of No. 48, Junction-road, Islington (Mr. J. D. Hunter for Mr. F. Kotch).—Refused.

Line of Frontage, Width of Way, and Construction.

Holborn.—A temporary wood and iron motor-car shed on the forecourt of No. 20, Red Lion-square, Holborn (Mr. M. Dukas).—Refused.

Line of Frontage and Space at Rear.

St. Pancras, West.—A deviation from the plans approved on October 9, 1900, under Sections 22 and 41 of the Act, for the erection of six buildings on the north-east side of a proposed diversion of Mornington-road and two buildings on the south side of Mornington-place, St. Pancras, so far as relates to the open space at the rear of such buildings (Mr. A. Whitelaw for London and North-Western Railway Company).—Consent.

Width of Way, Line of Frontage, and Construction.

Southwark, West.—An open iron and concrete gangway across Pontypool-place, Blackfriars-road, Southwark (Messrs. J. Hoare & Son for Messrs. J. Pascall, Limited).—Consent.

Formation of Streets.

Hammersmith.—That an order be issued to Messrs. Clutton sanctioning the formation or laying out of a new street for carriage traffic to lead from Emlyn-road to Hartswood-road, Stamford Brook-road, Hammersmith (for the Ecclesiastical Commissioners). That the name Palgrave-street be approved for the new street.—Consent.

Wandsworth.—A deviation from the plans sanctioned on February 19, 1901, for the formation or laying out of new streets for carriage traffic upon the Totterdown Fields estate, Upper Tooting-road, Wandsworth, so far as relates to an alteration in the position of roads A, C, and D on such plans (Mr. J. Briggs for the Housing Committee of the Council).—Consent.

Woolwich.—A deviation from the plans sanctioned on October 10, 1899, for the formation or laying out of new streets for carriage traffic upon the Eltham Park estate, High-street, Eltham, so far as relates to an alteration in the position of the road to be named Glenlea-road (Messrs. Logsdail & Beale for Mr. A. Cameron Corbett, M.P.).—Consent.

Greenwich.—That an order be issued to Mr. A. Roberts refusing to sanction the formation or laying out of new streets for carriage traffic out of the north side of Woolwich-road, Greenwich, westward of Lombard-road (for Mr. E. T. Fysh).—Agreed.

Hampstead.—That an order be issued to Messrs. Tuckett & Son refusing to sanction the formation or laying out of new streets for carriage traffic on the Powell-Cotton estate on the north side of Westbere-road and north-west side of Minster-road, Hampstead (for Mr. P. H. G. Powell-Cotton).—Agreed.

Lewisham.—That an order be issued to Mr. E. W. Evans refusing to sanction the formation or laying out of new streets for carriage traffic on the Grange estate, on the north side of Sydenham-road, near its junction with Elderton-road.—Agreed.

Lewisham.—That an order be issued to Mr. G. Tolley refusing to sanction the formation or laying out of a new street for carriage traffic in continuation of Oaksford-avenue, Wells-road, Sydenham.—(for Mr. A. Covell).—Agreed.

Wandsworth.—That an order be issued to Mr. J. C. Radford refusing to sanction the formation or laying out of two new streets for carriage traffic out of the east side of Putney Park-lane, Putney (for Mr. J. T. Leader and Mr. S. Taylor).—Agreed.

Wandsworth.—That an order be issued to Mr. W. Rivett-Carnac refusing to sanction the formation or laying out of new streets for carriage traffic to lead out of Gwendolen-avenue and Howard's-lane, Putney (for Mr. J. T. Leader).—Agreed.

Means of Escape from Top of High Buildings.

Southwark, West.—Means of escape in case of fire, proposed to be provided in pursuance of Section 63 of the Act, on the topmost story of a warehouse proposed to be erected at Vallongo Wharf, Upper Ground-street, Blackfriars (Mr. E. R. Hewitt for Messrs. Vestey Bros.).—Consent.

Westminster.—Means of escape in case of fire, proposed to be provided in pursuance of Section 63 of the Act, on the sixth and seventh floors of St. James's-court, James-street, Westminster (Mr. A. Blackford).—Refused.

Separation of Buildings.

Bermondsey.—The retention on the ground floor of an opening in the party wall between Nos. 215-217 and 219, Borough High-street, Borough, without making the buildings in conformity with Sections 74 (2) and 77 of the Act (Mr. T. W. Willis for Mr. F. H. Barker).—Consent.

Cubical Extent and Construction of Building.

Whitechapel and Bethnal Green, South-West.—The erection on the east side of Brady-street, Mile End, Whitechapel, between Thomas-passage and Bath-street, and extending back to Foster-street, of a beer store in two divisions, each division to exceed in extent 250,000, but not 450,000 cubic feet, and the erection of a cask-washing shed at such premises (Messrs. W. Bradford & Sons for Messrs. Mann, Crossman, & Paulin).—Consent.

Buildings for the Supply of Electricity.

Marylebone, East.—A chimney shaft and the permanent brick walls of a portion of a proposed electricity generating station on the east side of Grove-road, St. John's Wood, between the Regent's Canal and Lodge-place (Mr. C. S. Peach for the Central Electric Supply Company, Limited).—Consent.

Alteration to Building.

Dulwich.—A lumber-room in the roof of No. 19, Stradella-road, Herne-hill, without the walls of the building being thickened so as to make such walls comply with the first schedule of the said Act (Mr. A. T. Shorey).—Consent.

BOOKS RECEIVED.

BUILDING CONSTRUCTION: ADVANCED COURSE. By Charles F. Mitchell, assisted by G. A. Mitchell. (London: B. T. Batsford.)

CLASSIC ARCHITECTURE: A SERIES OF TEN PLATES ILLUSTRATING TYPICAL EXAMPLES OF THE GRECIAN AND ROMAN ORDERS. By Charles F. Mitchell and George A. Mitchell. (London: B. T. Batsford.)

OBLIQUE BRIDGES IN STONE AND BRICK. By Francis Campin, C.E. (Publishers of the *Railway Engineer*, 3, Ludgate Circus Buildings, E.C.)

THE SANITARY INSPECTOR'S HANDBOOK. Third Edition. By Albert Taylor. (London: H. K. Lewis.)

DIRECTORY OF AMERICANS RESIDENT IN LONDON, AMERICAN FIRMS AND AGENCIES. (London: Eden, Fisher, & Co., Limited.)

The Student's Column.

GAS AND GAS FITTINGS.

II.—ARGAND, REGENERATIVE, AND VENTILATING BURNERS. THE ALBO-CARBON LIGHT.

ARGAND BURNERS.—The Argand gas-burner is a modification of the Argand burner for oil-lamps invented by Argand about a hundred years ago, and many of the earliest Argand gas-burners were, in fact, merely Argand oil-burners altered to gas-burners. A perforated top was fitted in the position previously occupied by the wick, and the gas was admitted through the oil-inlet. Those primitive burners have, however, long been superseded by improved forms invented by Mr. William Sugg.

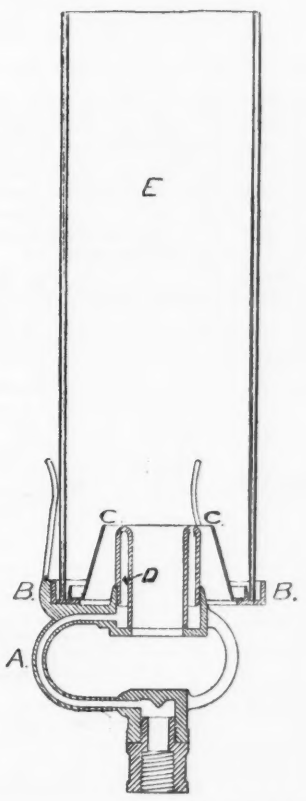


Fig. 22.—Sugg's London Argand.

The City of London Gas Act of 1868 stipulated that "The gas referees shall prescribe the burner for testing the illuminating power of the gas, and it shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and shall be practicable for use by the consumer." This proviso still remains in force, and the burner selected by the referees is "Sugg's London Argand No. 1." The Argand burners commonly used by gas consumers differ slightly in their dimensions from the standard Argand, but a description of this burner will serve to illustrate the principles upon which all Argand burners are constructed.

Sugg's London Argand No. 1 is shown in sectional elevation in fig 22. The burner consists of an annular hollow steatite ring (D) pierced with twenty-four holes for the passage of the gas, and connected with a metal body having three small supply tubes (A) and terminating in the socket which is screwed upon the gas service pipe. Above the supply tubes is a gallery (B) which carries a glass chimney 6 in. in height and 1⅞ in. in internal diameter (E). Around the steatite ring within the glass chimney is a metal cone which deflects the upward current of air upon the outer surface of the flame. Another supply of air flows to the flame through the central passage enclosed by the steatite ring, and thus is produced a hollow cylindrical flame supplied with air upon both its internal and external surfaces. Argand burners give the greatest light efficiency when supplied with gas under a pressure of less that 0·5 of an inch, and the dimensions of the chimney and burner orifices must be varied in accordance with the quality of the gas to be consumed. The holes in a burner for gas of low illuminating power must be larger than those made for a richer gas. The London Argand was intended to be used with 16-candle coal gas consumed at a rate of 5 cubic feet per hour, but the highest efficiency is always obtained by adjusting the gas cock to give a flame 3 in. in height. Argand burners are very sensitive to variations of gas pressure, and should therefore always be provided with a governor. The light efficiency obtained by the use of an Argand burner is usually appreciably higher than that obtained by the use of flat flame burners, but the necessity of using a glass chimney with each burner considerably detracts from its practical utility; and the heat emitted from the Argand flame and chimney also tends to make this form of burner unpopular.

It is sometimes argued that as the incandescent gas-light is now "practicable for use by the consumer," and gives six or seven times more light per unit of gas consumed than the Argand, the gas referees in selecting the burner "most suitable for obtaining from the gas the greatest amount of light" should select some form of incandescent burner. When the Act was passed the incandescent system of lighting was not in vogue, and the referees are undoubtedly acting in accordance with the intention of the Act in prescribing the Argand burner for testing purposes, but when comparing the relative cost of lighting by different illuminants London gas must now be accredited with an illuminating power of at least 20 candles per cubic foot instead of the 3·2 candles per cubic foot obtained with the use of the Argand burner.

Regenerative Burners.—The higher the temperature of an illuminating flame the greater is the intensity of the light emitted. Instead of allowing the gas to be consumed by admixture with air supplied to the flame at normal atmospheric temperatures, the air may be previously heated by the heat of the waste combustion products escaping from the flame, and by its radiant heat. By thus heating the air before allowing it to come in contact with the flame, the temperature of the flame may be raised, and its illuminating power thereby increased. Burners constructed to utilise the waste heat in this manner are termed "regenerative burners," and it is found that the light emitted from high-class burners of this description, such as those of Wenham or Siemens, is about three times greater per unit of gas consumed than that emitted from ordinary Argand or flat flames.

The simplest forms of regenerative burner are those constructed on the principle employed by Dr. Frankland in 1853, and by the Rev. W. R. Bowditch in 1854. They enclosed an Argand burner with two glass cylinders, one inside the other, and fitted a plate beneath the burner and outer cylinder so that the air admitted to the flame had to pass down between the two chimneys, and in its passage became strongly heated. Modern modifications of this burner have recently been placed on the market under such names as "the non-mantle incandescent gas-burner," the "mantleless gas-burner," and the like.

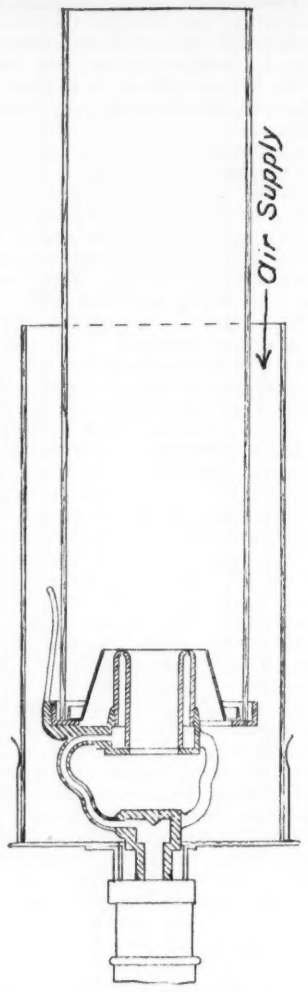


Fig. 23.—Regenerative Argand Burner.

These regenerative Argand burners (fig. 23) do not approach the large Wenham or Siemens type of burner in efficiency, but if well constructed give appreciably higher results than the ordinary Argands. The advantage gained in increased illuminating power is not, however, sufficiently great to compensate for the cost of the frequent renewals of the inner chimney, which is soon destroyed by the high temperature to which it is subjected, or for the inconvenience of having to periodically clean the two chimneys.

Regenerative lamps of the Wenham or Siemens type (fig. 24) also owe their increased lighting efficiency to the heating of the air supplied to the flame. The air is made to pass through a number of flues or passages heated by the products of combustion escaping from the flame. The burners are placed at a considerable height above the floor, and most of the light emitted from them is thrown in a downward direction. They are usually provided with flues to carry away the waste combustion products, after they have been deprived of as much heat as is practicable.

The regenerative lamp is often made to assist in the ventilation of a room (fig. 24). A perforated metal case is placed around the upper part of the lamp, and has its upper end sunk into the space between the ceiling and the overhead floor. The waste products of combustion passing from the lamp into the flue create an updraught, and increase the rate of flow of air through the room. The flue is carried in a horizontal direction between the ceiling and the floor overhead into a brick chimney, or into the open air. It is usually constructed of sheet iron, and must be carefully encased in non-conducting fireproof material.

Different persons have different notions as to what constitutes effective lighting, but Professor Lewes, in the Cantor Lectures delivered in 1897, refers to some experiments made in that year by Major Scott Moncrieff on the suitability of various burners for illuminating the interior of barracks and buildings of a similar character, and the deductions made by Major Scott Moncrieff from the results of his experiments may serve as a guide in estimating the amount of illumination required in other circumstances.

The barrack-room in which the experiments were conducted was 40 ft. long by 20 ft. wide, and the source of light was fixed 8 ft. above the floor. The illumination on a horizontal plane 2 ft. above the floor was then determined by means of a specially-constructed photometer. The height of 2 ft. was selected as representing the lowest level at which it would be necessary to be able to read printed matter.

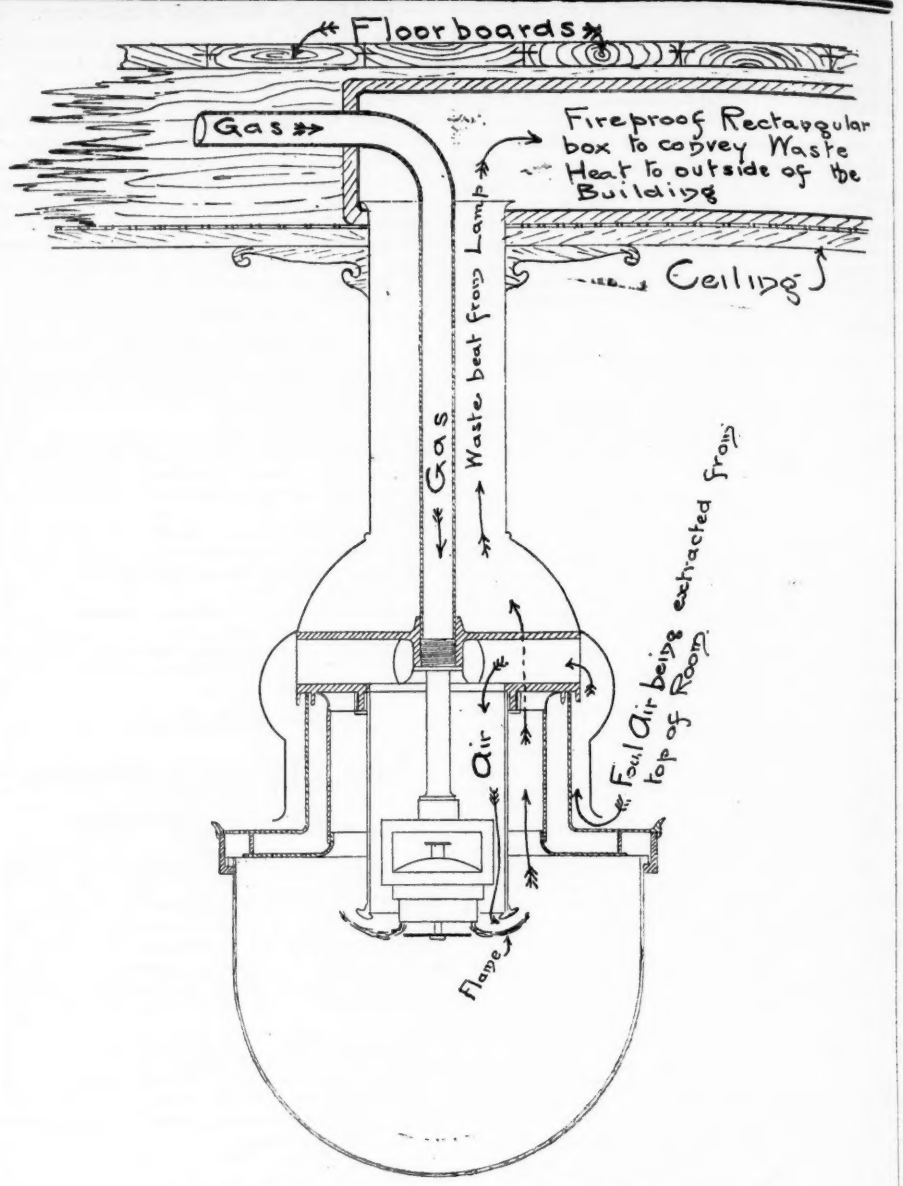


Fig. 24.—Regenerative Lamp used for Ventilating Purposes.

The following table shows the practical results yielded by the different burners :—

Illumination of a Barrack-room, 40 ft. by 20 ft., at a height of 2 ft. above the floor.

Description of burner.	Total gas consumption per hour, cubic feet.	Illumination
Two Bray burners....	16	Whole room insufficiently lighted, nowhere possible to read small print 6 ft. below gaslamp.
Two flat-flame burners fitted with caps	11·4	About one-quarter the working space illuminated.
Two Stott-Thorpe reflex lights	18	Eight-tenths of working level efficiently lighted.
Two Sugg's workshop lights.....	16	About one-quarter the working space efficiently lighted.
Siemens' regenerative	11	Whole room well illuminated.
Diemel regenerative..	9	Two-thirds working space efficiently lighted.
Two Schulke lamps ..	10	Practically whole working space illuminated.
Welsbach incandescent, with glazed conical reflector	4·3	Whole room brilliantly lighted.

The following conclusions were drawn from the results of the investigation :—

1. The present illumination of the barrack-rooms by means of No. 5 Bray burners is wasteful of gas and inefficient as regards illumination.

2. The Bray burner may be retained if used with caps and grouped as in the "Stott-Thorpe" arrangement. This may in some cases be extravagant in gas, but the illumination is good and the arrangement is not easily damaged, and ventilation is assisted.

3. For reading-rooms, sergeants' messes, officers' messes, and other accessory buildings, the incandescent light is the best illuminant.

4. For places where the light source is some height above the floor, as in gymnasia, lecture-halls, and churches, regenerative lamps give very satisfactory results.

Burners for Illuminating and Ventilating.—The initial cost of ventilating regenerative lamps of good quality is somewhat heavy, and lamps of this description have the disadvantage of requiring occasional cleaning by a skilled workman. For simultaneously lighting and ventilating large halls and theatres gas lamps of the "sun" or "sunlight" class are still extensively used. Strode's sunlight (fig. 25) may be regarded as a typical example of lamps of this kind. It consists of a number of flat-flame burners horizontally inclined and arranged in rings near the mouth of a ventilating shaft. The illuminating value per unit of gas consumed obtained from these burners is rather low owing to the cooling effect of the upward current of air, and the distance of the flame above the floor, but the general lighting effect is good, and where economy is not of the first importance they are often preferred to more economical burners. They are very simple in construction, and any of the burners which may become unfit for use may readily be replaced by new ones at very small cost.

Ventilating by Gas Flames.—When gas is

required solely for ventilating purposes, it is immaterial whether a luminous or a non-luminous "atmospheric" flame be employed. Chemical laboratories, for example, are sometimes ventilated by shafts in which gas burners are provided to produce a strong upward current, and in such cases luminous and non-luminous flames are of equal value. Mr. Thomas Fletcher found that with a vertical flue 6 in. in diameter and 12 ft. in height a gas flame had the ventilating values indicated in the following table :—

Gas consumed per hour. Cubic feet.	Speed of air current per minute.	Total air exhausted per hour.	Air exhausted per cubic foot of gas consumed.	Temperature at outlet of flue. Normal 62° F.
1	205	2,460	2,460	82° F.
2	245	2,940	1,470	92° F.
4	325	3,900	975	110° F.
8	415	4,980	622	137° F.

The most economical speed of air current for a flue of these dimensions is, therefore, that of 200 ft. per minute, obtained by consuming gas at the rate of one cubic foot per hour. Mr. Fletcher concluded from his experiments that for each circular foot of section in a ventilating flue the consumption of gas should not be allowed to exceed 5 cubic feet per hour.

The Albo-Carbon Light.—Albo-carbon is recrystallised naphthalene, one of the distillates obtained from coal tar. It is solid at atmospheric temperatures, but melts when heated to 174 deg. Fahr., a temperature considerably below the boiling point of water. In the albo-carbon lighting system the naphthalene is melted by the waste heat of the gas flame, and is used for enriching the gas as it passes to the burner. Lumps of albo-carbon are placed in a spherical metal reservoir fitted with a gas-tight screw cap. The gas enters the reservoir and passes through it to the burner. The flame raises the temperature of a copper conductor, which is located a short distance above it, and connected to the reservoir in such a manner that heat is rapidly conducted from the copper to the reservoir. In a few minutes the temperature of the reservoir rises above the melting point of the albo-carbon, and the gas flowing through the reservoir mixes with the naphthalene vapour, and its illuminating power is thereby increased. The burners used are flat flame burners with very small orifices, such as are used for consuming oil gas, and, according to Butterfield, a light of 25 candles is obtained with a gas consumption of $4\frac{3}{4}$ cubic feet per hour, and a consumption of 0·02 lb. of albo-carbon per hour. One albo-carbon reservoir may serve to supply a number of burners arranged in a cluster around it. A bright, steady flame is usually obtained, but the flame is more liable to smoke than the ordinary coal-gas flame, and more rapidly blackens the ceiling above it. The albo-carbon light is more economical than that obtained from flat coal-gas flames, but the trouble of periodically refilling the reservoir often prohibits its adoption, and of late years it has been largely superseded by the incandescent gas light.

Fig. 25.—Strode's Sunlight Ventilating Burner.

GENERAL BUILDING NEWS.

WESLEYAN CHURCH, WESTERHOPE, NEAR NEWCASTLE.—On the 7th inst. the foundation stone was laid of a new Wesleyan church for Westerhope. The buildings will be of stone, and the cost is estimated at about 500*l*. The large hall will accommodate some 500 persons, and the smaller one about 120. The architects are Messrs. Marshall & Tweedy, and the contractor Mr. W. J. Jamieson.

SCHOOL, ANSTRUTHER, N.B.—A new school has been erected by the Anstruther School Board at the west end of Melville-terrace. The school was designed by Messrs. Williamson & Inglis, architects, Kirkcaldy and Edinburgh, and provides accommodation for 320 pupils. The classrooms are planned so that by means of sliding screens a large room is provided. The building has two entrances, and a corridor 10 ft. wide running from end to end. From it the five classrooms enter, three being used by senior pupils and two by infants. The cost has been upwards of 3,300*l*.

BRITISH SCHOOLS, ILFRACOMBE.—The British Schools, situated in Fore-street, Ilfracombe, having become too small to accommodate the number of scholars attending, the trustees acquired the "Hermitage," with its house and grounds with entrances from High-street and Wilder-road, at a total cost of 3,108*l*. The building was then altered according to the plans of Mr. Allen Hussell. At present the old school will be used for infants, only the elder boys and girls being educated at the "Hermitage." The contractor is Mr. W. Smyth.

MASONIC HALL, OKEHAMPTON.—A new masonic temple was dedicated at Okehampton, a few days ago. The new building is of stone, in the Renaissance style, with slated roof. Externally, the structure is plastered, with brick dressings, while the roof is surmounted by an ornamental turret. The accommodation comprises robing and retiring rooms, a lodge-room, 36 ft. by 22 ft., with a height of 18 ft., a lavatory, and the necessary offices. The entrance lobbies and corridors have tile floors, and all are provided with swing doors. The lodge-room has an open roof. The contractor was Mr. Sleeman, of Okehampton, who executed the work in accordance with the designs of Mr. J. A. Lucas, F.S.I., Exeter.

CHILDREN'S HOMES, HUDDERSFIELD.—Children's homes have been erected at Outlane by the Huddersfield Board of Guardians. There are two homes in the block, the rooms being arranged on exactly similar lines. The building is of local stone. The following is a list of the contractors :—Mason and slater, Mr. J. Hellawell; joiner, Mr. M. Hirst; concreter, Mr. John Cooke; plasterer, Mr. T. R. Crowther; plumber, Messrs. Milnes & Garside; ironmonger, Messrs. T. Heaps & Co.; painter, Mr. A. Wood. Mr. J. W. Cocking, architect, Huddersfield, prepared the designs, and the work has been carried out within his estimate of 2,000*l*.

LABOURERS' DWELLINGS FOR NEWCASTLE.—Mr. M. K. North, A.M.I.C.E., one of the inspectors of the Local Government Board, sat in the Council Chamber of the Town Hall, Newcastle, on the 3rd inst., to conduct an inquiry into an application made by the City Council to the Local Government Board that sanction should be given to a scheme for the erection of dwellings for the labouring classes. The Town Clerk (Mr. Hill Motum) was present, as well as the Surveyor (Mr. Liddle). The Town Clerk said that in carrying out certain of the street works authorised by their Newcastle-on-Tyne Tramways and Improvement Act of 1899, the Corporation, in acquiring property for that purpose, would acquire a number of houses occupied by the labouring classes, within the meaning of Section 114 of the Newcastle Improvement Act of 1892, which was incorporated with the Act of 1899, and now sought the approval of the Local Government Board to a scheme for providing accommodation or dwellings for the labouring class displaced, or for such number of them as under Section 114 they were bound to provide for. The Corporation submitted a scheme for building two blocks of dwellings, one on the site in Albion-row and another on the site in Walker-road. These two blocks of buildings would comprise seventy-two separate dwellings—that was to say, on the Albion-row site the accommodation would be six separate dwellings of three rooms each; and upon the Walker-road site sixteen separate dwellings of one room each, twenty-three separate dwellings of two rooms each, and twelve separate dwellings of three rooms each. They proposed that these houses should afford the most modern accommodation for such class of houses. In the separate dwellings of one room each, there would be a large room, 15 ft. in length, 12 ft. 9 in. in width, and 9 ft. in height, with a screened bed recess, a sink recess, a pantry, a separate water-closet, and a separate coal-bunker. In the dwellings of two rooms each there would be a large living-room 15 ft. in length, 12 ft. 6 in. in width, and 9 ft. in height, with a bed recess, a sink recess, and a pantry, and with a separate bedroom 14 ft. in length, 12 ft. 9 in. in width and 9 ft. in height; also with a separate water-closet and coal-bunker. The houses of three rooms each would have a kitchen, 15 ft. in length, 12 ft. 9 in. in width, and 9 ft. in height, with a bed recess, sink recess, and pantry, two separate bedrooms, one 14 ft. in length, 12 ft. 6 in. in width, and 9 ft. in height, and the other 12 ft. in length, 9 ft. 6 in. in width, and 9 ft. in height. There would also be to each a separate water-closet and coal bunker. Each of these separate dwellings would have the use of a washhouse, and an ash-shoot from each floor to an ash-box on the ground floor. Each room in each dwelling would have a fireplace, and be adequately ventilated. The dwellings would be three stories high. The Surveyor (Mr. Liddle) explained the plans to the Inspector.

CARDINAL NEWMAN MEMORIAL CHURCH, EDGBASTON.—According to the *Birmingham Post*, plans for a memorial church to Cardinal Newman have been prepared by Mr. E. Doran Webb, F.S.A.

SYNAGOGUE, FINSBURY PARK.—The Finsbury Park Synagogue, which was consecrated by the Chief Rabbi on the 8th inst., is situated in Princess-road, Finsbury Park. The building provides accommodation on the ground floor for 190 gentlemen and in the galleries for 144 ladies, 334 in all, and is constructed to meet the growing needs of the small congregation, which has been established for many years in temporary premises in Portland-road. The building is provided with two stone staircases, a complete installation of heating on the American plan, and ample cloakroom accommodation for both ladies and gentlemen. The exterior is executed in red brickwork, relieved with stone dressings. The principal entrances to the ground floor are on the main façade in Princess-road, the secondary entrances and the entrances to the galleries being at the rear of the site. The building has been constructed by Messrs. Whitehead & Co., Limited, from the designs of Mr. Delissa Joseph.

CATTLE MARKET, BODMIN.—A new market was opened on the 2nd inst. at West Heath, Bodmin. The work has been carried out by Mr. E. Harris, contractor, Bodmin, and the cost has been about 2,000*l*., exclusive of site. The work has been performed under the direction of Mr. E. J. Oliver, Borough Surveyor, who designed the whole of the premises.

PUBLIC HALL, HATFIELD, YORKSHIRE.—On the 5th inst. the foundation-stone of a new public hall, to be called the Victoria Hall, was laid at Hatfield. The new building will be 48 ft. by 24 ft., with ante and dressing-rooms, and other rooms for storage, &c. The architect is Mr. Thomas Moat, of Hatfield, and the contractors Messrs. J. D. Gambles & R. Harrop, of Hatfield.

TEMPERANCE HALL, HUDDERSFIELD.—The new Temperance Hall fronting the south side of Princess-street, erected for Huddersfield Temperance Society, was opened recently. The building is in the Italian Renaissance style, and has been erected, at a cost of about 5,000*l*., from designs and plans prepared by Mr. B. Stocks, architect, Huddersfield. The front is faced with extra hammer-dressed wallstones with ashlar dressings, and the back, in Page-street, with hammer-dressed wallstones and ashlar dressings. The bottom floor is intended to be used as a temperance club, and the remaining two floors provide rooms for meetings and offices for the executive work of the Huddersfield Temperance Society, &c. The work has been carried out by the following Huddersfield contractors :—Messrs. John Radcliffe & Sons, masons' work; Messrs. Wood Bros., joiners' work; Messrs. Milnes & Garside, plumbers' work; Mr. T. B. Tunnacliffe, slaters' work; Mr. W. E. Jowitt, plasterers' work; Mr. Allen Jackson, painters' work; Messrs. Henry Brook & Co., Limited, ironfounders' work; Mr. John Cooke, concreters' work; Messrs. Tomlinson & Milan, Limited, hot-water engineers' work; and Messrs. T. A. Armitage & Co., electrical engineers' work.

TOWN HALL EXTENSION AT SHOREDITCH.—On the 9th inst. the Mayoress of Shoreditch (Mrs. Kershaw) laid the foundation-stone of a new wing which is being added to Shoreditch Town Hall. The extension is on similar lines to the old building and will afford extra accommodation for all departments. The architect is Mr. W. C. Hunt, and Messrs. Killby & Gayford have the building contract, which amounts to 2,833*l*.

FLATS, RUTLAND GATE.—The foundations are now being put in for the four blocks of flats which are to be built upon the site of Stratheden House, Rutland Gate. Mr. Delissa Joseph is the architect.

SYNAGOGUE, HAMPSTEAD. — The Hampstead Synagogue, which was reconsecrated by the Chief Rabbi, after enlargement, on September 8, was originally built nine years ago from Mr. Delissa Joseph's plans. The enlargement has been effected by removing the east wall of the synagogue and extending the building eastward to the limit of the site. The choir, which was originally at the rear of the Ark, is now in the gallery above the Ark. The original number of sittings in the building was 366 on the ground floor and 299 in the gallery; the additional seats provided by the enlargement are eighty-four on the ground floor and sixty-two in the gallery, giving a total seating capacity for 811 souls. Although the present two staircases in Dennington Park-road are in excess of the needs of the London Building Act, the opportunity has been taken, in

effecting the extension of the building, to provide two supplementary staircases at the east end, one of which leads directly into West End-lane. The design of the original structure has been maintained in the extension, and the opportunity has been taken of redecorating the entire building in pure white. The contract has been carried out by Mr. Henry Lovatt, from the designs and under the superintendence of Mr. Delissa Joseph.

FOREIGN.

FRANCE.—Forty-eight young architects have entered into the preliminary competition for the Chaudesaigues Prize, the subject being "A triumphal arch in honour of a foreign Sovereign." The jury have selected twelve of these to enter into the final competition.——The new Sorbonne is now completed, with the exception of some of the interior artistic decoration, which is being actively carried on. M. André Brouillet has been commissioned to paint the panels of the Vice-Rector's reception-room, and it is proposed to commission M. Poilpot to execute a series of "paysages historiques" in the Salle de la Faculté. It is expected that the formal opening of the new buildings, several times postponed, will now take place at the end of the present year.——The modern Gothic fountain in the Square de l'Archevechée, to the east of Nôtre Dame, Paris, is in process of repair and restoration. It was erected in 1843 from the designs of the architect Parfait Merlieux.——At the Hôtel des Chambres Syndicales du Bâtiment, in Rue de Lutèce, Paris, an exhibition has been opened of the designs sent in for the tenth competition instituted by the "Société Nationale des Architectes." The subject is "A Hospital for Temporary Aid to the Injured."——The Government will shortly commence the works necessary for the construction of a masonry bridge at Valence, to replace the suspension bridge which at present crosses the Rhone opposite that town. The cost is estimated at 1,165,000 francs.——The death is announced, at the age of 72, of M. Emile Basly, member of the Société Centrale des Architectes. He was a pupil of Garnaud, and had obtained, at the time of the 1900 exhibition, the medal offered for the author of the best works in domestic architecture.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Mr. Henry Rose, architect, has removed to Holy Rood-street, Chard, from 3, Staple-inn, London.——Mr. J. W. Start, F.S.I., architect and surveyor, High-street, Colchester, and New Broad-street, E.C., has taken Mr. Reginald Rowell, A.R.I.B.A., into partnership. The firm will in future be known as Start & Rowell.

NEW ELECTRIC STATION, ABERDEEN.—The tender of Messrs. G. Donald & Sons, painters, Aberdeen, has been accepted (690*l.*), and also that of Messrs. Sellar & Co., Aberdeen (1,298*l.*) for subway.

EXPORTS OF TIMBER FROM DANTZIG.—An official return shows that the quantities of wood exported from Dantzig during the past five years have been as follows:—In 1896, 234,605 tons; in 1897, 272,604 tons; in 1898, 265,756 tons; in 1899, 308,640 tons; in 1900, 252,342 tons. The year 1900, it is stated authoritatively, was in many ways very profitable for the Dantzig timber trade. The general prosperity prevailing in commercial circles all over the world had a beneficial influence on sales, more especially in the spring, and prices ranged between satisfactory limits. Oak sleepers were an exception, and they were practically unsaleable at Dantzig, as the German State railways now use pine and fir. Other descriptions of oak were also sold with difficulty and at a loss. The several sawmills were fully occupied, but were adversely affected by the more rapid rise in price of the raw material as compared with the sawn wood. In some cases deals and planks were sold for less than the timber cost from which they were cut. Prices for round timber fell towards the end of the year, and only the best qualities were saleable at lower rates. The export trade was, on the whole, carried on during the year under favourable circumstances. There were either floated down the River Vistula or reached Dantzig by railway the following timber goods:—In 1898, 665,055 cubic metres, value 1,010,975*l.*; in 1899, 717,160 cubic metres, value 1,093,900*l.*; in 1900, 429,159 cubic metres, value 637,830*l.*

GREAT FIRE IN THE CITY.—Shortly before three o'clock on Saturday last week one of the City constables discovered smoke to be issuing in dense volumes from the premises of Messrs. W. H. Lascelles & Co., cabinet makers, &c., of 121, Bunhill-row He at once raised an alarm, and by three o'clock about twenty steamers were at work, and this number was gradually augmented until a quarter past three, when no fewer than thirty had been turned out and had got connected with the hydrants. Messrs. Lascelles' works stand in the centre of a group of factories and buildings. The group forms a block, having frontages in Chiswell-street, Whitecross-street, Errol-street, and Lamb's-buildings. Adjoining the works is a timber yard belonging to Messrs. Wm. Oliver & Sons. Backing on to these are the stores of Whitbread & Co.'s brewery, and surrounding the whole are shops, dwelling-houses, a Board school, a mission hall, the headquarters of the London Rifle Brigade, and the depôt of the Globe Parcel Express Company. It was not until about five o'clock that the fire was under control. Nearly the whole of Messrs. Lascelles' buildings and contents have been destroyed. The front stage and contents in Bunhill-row belonging to Messrs. Oliver & Sons are mostly saved, but three-fourths of the firm's stock was completely destroyed, and the damage done by burning, cutting away, heat and water to the surrounding places belonging to Messrs. Whitbread & Co., and Le Grand & Sutcliff, artesian well engineers, was considerable. The fire did not damage the interior of the premises of Messrs. W. Walker & Sons, wholesale cabinet makers, Bunhill-row, but the exterior was damaged in several respects. Their stock is intact, and work and machinery are going on as usual. Messrs. Lascelles & Co. have secured the premises recently occupied by Messrs. W. Scrivener & Co., which, with their own premises at Stratford, will, we are asked to state, enable them to continue their joinery business without any delay. Communications are still to be addressed to their old address, 121, Bunhill-row, London, E.C, as the offices have not been seriously injured. Messrs. Oliver & Sons have asked us to state that they will, owing to their stocks of timber elsewhere, be able to continue their business as usual, and all letters and orders should be addressed to their head office, 120, Bunhill-row.

AUCH.—The artist of the glass, described in our article on Auch last week as a Saxon, was a Gascon; and the words printed "choir, organ," should be "choir-organ."

MUNICIPAL TECHNICAL INSTITUTE, WEST HAM—The day and evening classes at the Municipal Technical Institute, Romford-road, Stratford, E., will commence on the 21st inst. Classes have been formed in physics, electrical engineering, civil and electrical engineering, art, building, &c. The lecturer in building construction is Mr. Edward Willis, A.M.Inst.C.E., F.S.I., M.San.Institute; the lecturer in technical drawing is Mr. J. H. Fry, F.S.I.; and the lecturer in quantity surveying is Mr. W. E. Trent, F.S.I. The instruction given is of a thoroughly practical character.

REMOVAL OF HOUSE REFUSE FROM FLATS.—The following interesting observations appear in Dr. J. King Warry's Report on the Sanitary Condition of the Hackney District for the year 1900:—During the last few years a gradual change has been creeping over the social life of Londoners. The "home" occupied by one family has given place to the "flat," a unit of a group of families as closely lodged together as the ingenuity of architect and builder can bring them. The closer aggregation of these families demands, therefore, more vigilance in keeping their surroundings free from harmful influences; but the structural arrangement of the block has introduced certain difficulties in safe-guarding their health. The particular difficulty I have met with in Hackney is connected with the disposal of the house refuse in connexion with these buildings. The blocks of flats in this district contain from two to five floors. The arrangements for the deposit of the house refuse until removed by the Local Authority differ. (*a*) In a few blocks portable dust-bins are provided for each tenement to hold the week's refuse, which is kept either on the landing near the door of the tenement or inside the scullery. (*b*) In others a shoot is formed in the walls of the blocks, with doors opening into the passages at the level of each floor, to receive the house refuse from the tenements at that level. At the foot of the shoot is a chamber near the doors of the tenements on the ground floor. Into this the refuse falls and remains until removed by the local dustman. (*c*) Another arrangement, worse than the last, is somewhat similar with the exception that the opening to the shoot is in each kitchen. In some the openings are closed by a simple wooden shutter sliding in grooves, in others an iron drum, one-third of which is open, is arranged horizontally, and is worked by a lever. When the lever is depressed the drum is ready to receive the refuse, and by elevating the lever the drum revolves, throws the dust into the shoot, and is then supposed to cut off all effluvia from the shoot; but, as a matter of fact, on testing it is found they are not air-tight, and it can easily be demonstrated in all that the shoot ventilates into the living-room. The common chamber, or dust-bin to each shoot, is usually in these cases at the rear of the block, where it is emptied once a week. It is obvious that neither of these arrangements is satisfactory. In the first case, the presence of foul-smelling dustbins close to the doors of living-rooms and in passages alive with children is clearly bad. The same remark applies to the arrangement of shoots with doors opening on the landing. Practically the shoots are ventilated into the passages, and this is especially the fact when the chamber receiving the dust from the shoot is at the foot of the staircase. It is almost unnecessary to state that these chambers are very offensive at times. But the most objectionable are those shoots with shutters or other openings into the living rooms. The tenants complain that an evil smell proceeds from them even when closed; that dust is forced into the room when the shoot is used by tenants on an upper floor; that when used by themselves the dust is blown back into the room, and it is consequently extremely difficult to keep the room clean. It would not have been difficult when these blocks were designed to have devised some means by which these difficulties could have been avoided, but now it would involve much labour and expense to make any satisfactory alterations. It is an axiom of sanitation that house refuse should be removed from the neighbourhood of occupied dwellings at the earliest possible date, and if this is true of the house with its attached open space or garden, how much more so is it true of a block accommodating some of them several hundreds of persons? It is contrary to all sound principles of sanitation that garbage should be kept at the doors or under the stairs of occupied houses, or that dust shoots should ventilate into the passages or living-rooms of the same. Even if a daily collection were established it would not remove the objections to the above. The shoots must be abandoned, but our difficulty is to find a place free from objection for the portable bin. It must either be kept in one of the rooms of the tenement itself, or on the staircase or outside at the back of the block. The last is so inconvenient to tenants that they will not adopt it, and of the two former expedients it is difficult to say which is the less objectionable. My object in discussing this is to show how easily such difficulties could be avoided if architects were to give a little of the thought expended on decorations to the convenience and sanitation of dwellings. I am also not without hope that the London County Council will endeavour to obtain such alterations in the Building Acts as will effectually remedy the above condition of things.

BUILDING CONSTRUCTION CLASSES, HIGH SCHOOL OF GLASGOW.—The building construction classes at this school have just been opened. An additional feature of the classes this session is that students will have the opportunity of studying workshop practice in Kent-road School as a branch department of the High School, the two classes working in conjunction with one another. The architectural lecturer in the theoretical department is Mr. D. Bennet Dobson. The practical workshop department is for the use only of students attending the theoretical department.

WATER SUPPLY WORKS, WESTBURY, WILTS.—New waterworks were opened at Westbury on the 4th inst. The cost of construction has been about 13,000*l.*, and the scheme was prepared by Mr. W. H. Stanley, C.E., of Trowbridge. The pumping station is situated on the Bratton-road, about a mile from the town. It is a red brick building, with Bath stone dressings, and contains a storeroom and repairing shed.

BATTERSEA POLYTECHNIC.—The prospectus of the day and evening schools and classes at the Battersea Polytechnic gives a good idea of the thorough character of the work carried on at this institution and of the provision which has been made for the technical, scientific, and general education of the inhabitants of Battersea, Clapham, Wandsworth, and neighbouring districts. The principal work of the Polytechnic is the provision of evening classes for both sexes in all subjects of technology, pure and applied science, art, commerce, domestic economy, and music; but it also provides a technical day school, a science day school for boys and girls, a training school of domestic economy, a domestic economy school for girls, a day school of art, and special day courses in science and technical subjects. During the last session, 250 evening classes in more than 100 different subjects were attended by over 3,100 individual students, while 520 students were in regular attendance at the day schools and classes. The institute is provided with workshops for engineers, smiths, carpenters and joiners, pattern-makers, plumbers, bricklayers, masons, plasterers, and painters and house decorators, and with laboratories for engineering and mechanics, electrical engineering, physics, chemistry, and natural science, and with an art school, photographic rooms, &c., and with ordinary lecture and class rooms, refreshment-rooms, and a great hall. The successes in day and evening classes for the session 1899-1900 included:—A Whitworth Exhibition, three Intermediate County Scholarships, twenty-six Evening County Council Exhibitions and Scholarships, thirty-seven Medals and Prizes, three Domestic Economy Training School Scholarships; total value of scholarships, exhibitions, and prizes, 1,222*l.* The principal is Mr. Sidney H. Wells, A.M.Inst.C.E.

CLOCKS FOR TRAMWAY DEPOTS.—The London United Tramway Company have placed an order with Messrs. J. W. Benson, Limited, of Ludgate Hill, for three large clocks for the depots at Acton, Hanwell, and Hounslow, the first having a large illuminated dial.

CAPITAL AND LABOUR.

CARPENTERS' DISPUTE AT BARRY.—Barry carpenters, who came out on strike in May, 1900, for an advance in wages from 8d. to 9d. per hour, have now declared the dispute at an end, and claim that the majority of employers in the district pay the advanced rate. The local Master Builders' Association, on the other hand have refused as a body to recognise the advance, and have since that time employed non-unionists at 8d. per hour.

LEGAL.

ARBITRATION CASE.

MR. GODFREY PINKERTON has now published his award in the matter of the arbitration between Mr. John Thomas Hockley, of Grantham, builder (trading as R. Hockley & Son), and the Trustees winding up his estate, Messrs. John Simpson (Grantham) and J. T. Medcalf (London), against Henry Metcalf and Thomas R. Greig, trading in co-partnership as architects in London. The dispute arose on a contract entered into by Hockley with Metcalf & Greig to build some large flats known as "Irema Mansions," South Kensington, London, for the sum of 25,762*l.* Hockley did a large amount of work on the contract, but, in consequence of the failure on the part of Metcalf & Grieg to keep up their payments, he stopped work and ended the contract. Over and above the amount paid by Metcalf & Grieg prior to the stoppage of the works, Hockley claimed there was due, for work actually executed, a large sum of money. It was also claimed that Metcalf & Greig had been guilty of a breach of contract, and that Hockley was justified in putting an end to the same, and was entitled to damages from Metcalf & Greig for loss on plant, &c., and of profit on the contract. On the other hand, Metcalf & Greig contended that Hockley had been fully paid for all the work he had done, that he was not justified in stopping the work, and that he had committed a breach of contract, and they claimed over 6,000*l.* damages for their loss in consequence. The arbitrator decided and adjudged—(1), that the sum of 2,025*l.* 1s. 9d. was due from Metcalf & Greig in respect of the work executed by Hockley, the value of which he fixed at 17,169*l.* 1s. 9d.; (2), that Metcalf & Grieg should pay the sum of 764*l.* for loss incurred by Hockley upon plant and material supplied on the contract; (3) that there was nothing due from Hockley to Metcalf & Greig in respect of damages claimed by them; (4) that Metcalf & Greig should pay the costs of, and incidental to, the reference, and the costs of the award, as between party and party; (5) the arbitrator also decided that there had been a breach of contract on the part of Metcalf & Greig, and that Hockley was entitled to the sum of 1,183*l.* for loss of profit on the contract, the total sum under which Hockley would have been entitled to be paid, had he completed it, amounting to 29,000*l.* As regards the last item of the award, the arbitrator reserved a point of law, which is to be submitted in the form of a special case stated by the arbitrator to the High Court, as to whether, on the facts stated therein, Hockley is entitled to be paid the sum representing the loss of profit, or any part of such sum; the costs of the special case to be left to the Court. The first part of the award will be enforceable forthwith, but the special case will have to be argued after the Long Vacation, as soon as it can be brought on.

Mr. Theodore Norton, Grantham, was the solicitor acting for Hockley and his Trustees; and Messrs. Morris & Richards, London, were solicitors for Metcalf & Greig.—*Grantham Journal.*

RECENT PATENTS:

ABSTRACTS OF PATENTED INVENTIONS.

8,731.—A CAN FOR USE BY PAINTERS AND OTHERS: *E. G. Hill.*—A can for use by painters, French polishers, and other workmen is provided with an interior clip which secures the brush and a wire for the removal of surplus liquid from the brush.

8,780.—PREVENTION OF SPARKING: *E. Eugene-Brown.*—In order to provide a fixed line of commutation and thereby to prevent sparking the inventor makes slots in the field poles in directions at a right angle to, as well as parallel to, the lines of force; for a motor in which the direction of rotation is to be reversed both portions of the divided pole are slotted, and for a dynamo he makes one of the right-angled slots in the back portion of the pole; the slots at a right angle to the lines of force may be cut upon the outer sides of the pole.

8,791.—A METHOD OF ROOFING: *W. P. Whitmore.*—To the outer edges of sheets made of tarred roofing-paper or felt are applied plain untarred strips of fabric, and the upper and lower edges of a covering strip respectively are fastened to one overlapping roofing-sheet and to a layer of cemented or asphalted gravel upon the other roofing sheet, both of which sheets are secured with nails, &c., which the covering-strips protect. The strips are overlaid on their outer sides with asphalte and gravel, the next adjacent joint being made in the same manner.

8,792.—COLUMNS FOR BUILDING PURPOSES: *G. F. Pfahl and W. P. Maynard.*—The columns consist of grooved interlocking blocks, which are cemented or glued together so as to form half columns, the halves being then glued together and joined with interior tie-blocks having dove-tail tongues that fit into grooves cut in the blocks.

8,796.—A CIRCULAR SAW FOR CUTTING PAVING-BLOCKS: *F. Barr.*—The multiple circular saw is intended for cross-cutting battens into pavement blocks; the saws are mounted at the distances required upon a spindle, which is journaled in a sliding frame that is reciprocated by means of a crank upon the main shaft; as the batten is forced endwise on to the pivoted bench, which can be turned down for the removal of the blocks which have been cut, a cam upon the main shaft works the bench by means of rods and a bell-crank.

8,807.—A CONTRIVANCE FOR USE WITH CRANES: *F. Schofield and B. Johnson.*—The inventors' object is to furnish means of rendering an ordinary travelling crane available for driving piles; they fasten the monkey-frame with stays to the rotating frame, which, in one form, may be mounted upon a detached trolley; for the employment of several monkeys at one and the same time they pivot the customary weighted tripping-levers on to a cross-bar, which is hung upon the lifting-chain and is provided with a guide mounted in the frame.

8,814.—RETAINING-WALLS FOR TEMPORARY PURPOSES: *F. Hennebique.*—The retaining-walls are devised for occasional use upon quays, wharves, and similar platforms, they consist of sets of portable cement blocks which are fashioned with a base, a front, and buttresses, and are strengthened with bars of iron: confer also Nos. 10,203, 30,143, and 30,144 of 1897.

8,818.—SLATE MANTELPIECES AND THEIR PARTS: *W. F. Lewis.*—A detached plinth is fastened in a recess made in the jamb or pier, with bolts inserted through holes in the jamb and into screw-threaded holes in blocks that are leaded in the plinth, the plinth thus specified will be adaptable for a jamb or pier, having side-strips which are fastened with angle-pieces and screws inserted in leaded-in blocks. For joining the strips the edges of one of them are pierced for a plate with a threaded hole, a bolt or a wood-screw is passed through the other strip into the screwed hole.

8,820.—MANUFACTURE OF WHITE LEAD: *E. R. Blundstone.*—A strongly alkaline solution is made by dissolving litharge in lactic acid or lead lactate, which will remain in solution ready to be used again. Then, by the employment of carbonic acid, the white lead is precipitated from the solution until it has become neutralised.

8,822.—MECHANISM FOR USE IN GRINDING TOOLS: *C. V. Boys.*—A double guide is devised for grinding a tool against one of two wheels, the tool being held against a bar which may be set at any angle to a piece which will slide in a groove in a plate in order that the tool may be carried across the face of the wheel. The plate, upon the inclined face of which the tool is laid, is caused to slide parallel to the axis of the wheel by a projection that engages with a support which has arms that embrace the wheels, and is adjusted vertically with screws, the inclinations of the four faces of the plate to the horizontal correspond with the angle which is necessary for the clearance of the tool. The two wheels serve for rough and fine grinding respectively, and the angles of the faces are modified in accordance therewith.

8,831.—CONSTRUCTION OF COFFER-DAMS, CAISSONS, BREAKWATERS, PIERS, WELL AND PIT LININGS, &c.: *G. L. Mouchel.*—The blocks or sections consist of concrete moulded around a framework of metal. In the case of a cylindrical foundation cylinder, each of the three sections is made by moulding a thin shell of concrete around the frame in such a manner that the upper concaved end of one shell shall fit the lower convexed end of the next adjoining shell with a layer of grout filled in between them, their end flanges are bolted together, spaces being left in the framework free from concrete, then the flanges and shell are completed by embedding metal loops, which join the bare portions of the framework together with those portions of the framework in more concrete. For rectangular blocks for a quay wall, each block rises to the height of the wall and its two parts are grouted together and strengthened with beams of concrete and a framing of metal, adjoining blocks being fastened together with bars, and concrete being filled into the intervening spaces.

8,849.—AN APPLIANCE FOR WINDOWS: *H. T. Thurman and F. Smith.*—The flange and the rounded body of a pulley frame (held in its place with screws at the sides or at the top and bottom corners) are arranged so as to engage with a rectangular slot in the pulley stile, and in the latter is also cut a rounded recess having a diameter larger than the width of the pulley stile, a face-plate of metal is affixed with pegs at the sides or corners to the flange of the pulley frame.

8,868.—MECHANISM FOR USE WITH LIFTS: *D. Corcoran.*—Upon a frame which is fastened to the cage are pulleys that serve to keep endless chains in engagement with racks upon the lift-guides, and the chains, passing beneath guide-pulleys, are placed in engagement with worms upon the shaft of the rope-pulley which is engaged by a bight of the driving-rope that is extended throughout the well; the cage will rise or fall, respectively, with the driving in the one or the other direction of the rope-pulley. In a variant form the racks are secured to opposite sides of the same guide.

8,871.—MANUFACTURE OF PRISM GLASS: *M. F. Ewen.*—For making glass with prismatical ridges a sheet of glass is cemented in a ribbed and heavy frame of metal which is laid on the table of a planing machine, and adjusting screws fasten a set of tools having ridged faces in another frame. The glass is moved to and fro underneath the tools for making the grooves, whilst moistened emery is applied to its surface, and polishing powder is used upon rollers laid end to end, or upon a single grooved leather roller.

8,888.—AN INSTRUMENT FOR DRAWING AND MEASURING ANGLES: *P. Jacolin.*—The instrument, which can be combined with a slide-rule, comprises a double blade to one end of which is pivoted a blade that can be folded within it, and is marked with a protractor and a tangent-line. At the end of the double blade, which is cut away so as to expose the protractor, are reading-marks, and graduations are set out upon the blades.

8,919.—MEANS OF MEASURING RELATIVE ANGULAR DISPLACEMENTS: *J. F. Guest.*—The single-reading apparatus is intended for the measurement of relative angular displacements, and may be combined with the ordinary optical means for taking observations by double reflection; the two mirrors are carried upon rods, which turn and slide in sleeves, and upon clamps.

8,934.—A SMOKE-CONSUMING APPLIANCE: *R. H. Burns.*—A ring-pipe, or similar chamber, provided with hanging funnels or tubes having pierced ends and sides, serves for the admission of air, or some other medium which will assist combustion, so as to mingle with the products of combustion in the hood or uptake of a vertical boiler. The funnels, which should be mounted upon ball-joints, have deflectors disposed underneath them.

8,941.—A FASTENING FOR WINDOW-SASHES: *D. Stewart.*—The meeting edges of the sashes are covered with a plate which is secured, in preference, to the lower sash and has a recess which may be formed by folding over the plate; to the other sash is pivoted a bolt which, when one wishes to fasten the window, is to be turned round into engagement with the recessed plate of which the overlapping part will prevent the bolt from being moved from outside the window. The sashes can be drawn to one another, and their rattling obviated, through the engagement of an inclined slot in the plate with a lug upon the bolt as the bolt is turned round.

8,946.—A CONTRIVANCE FOR VENTILATION: *J. S. Wrightnour.*—The inventor seeks to furnish means of evaporating nitrogen from liquid air, and utilising the remainder that has been evaporated so as to oxygenate the atmosphere of hospital wards, auditoria, and similar apartments. He fashions a container at the bottom of a vessel, into which liquid air is caused to flow. The lower part of the vessel is hermetically sealed around the container, and is composed of and covered with materials that will not readily conduct heat, such as lead, wool, glass, and so on, or glazed tiles having hollowed or porous interiors into which liquid air or its gases will percolate. Some good heat-conducting substance constitutes the upper portion of the vessel, in order that the nitrogen shall first evaporate as the liquid air flows from and over the bottom of the container. When the nitrogen has been drawn away, the oxygen that is left will flow through pipes into the space which is to be ventilated, and it may be heated as it flows through a metallic portion of the flexible pipe. A stand, having racks and a rod, and a pivoted back and bottom (in the shape of a chair), serves to support and tilt the vessel whilst the apparatus is doing its work.

8,994.—APPARATUS FOR WARMING BUILDINGS: *T. Whitwell.*—The inventor's object is to retain and utilise the water arising from condensation in hot-water circulating apparatus; a pipe conveys steam to the coil in the heater, and to the pipe or coil outlet is joined a steam pipe which another pipe through a non-return valve joins to the water space of the heater; the cistern has a pipe for the overflow (which may be returned into the steam boiler), and is connected to the cold end of the circulating pipes by means of a pipe that is U-shaped at the end and is fitted with a controlling valve.

9,063.—A LIFT VALVE: *A. Nixon.*—For a screw-down tap or valve is devised an especially packed valve disc, within which is placed a cone-shaped plug or packing formed of an admixture of antimony sulphide and asbestos, ground up with rubber dough, and moulded into the shape desired. The compound is described as being suitable for other kinds of valves.

MEETINGS.

SATURDAY, SEPTEMBER 14.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at Southwark and Vauxhall Waterworks, Hampton. 3 p.m.

MONDAY, SEPTEMBER 16.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. Priestley, B.A., on "Sanitary Law." III. 7 p.m.

WEDNESDAY, SEPTEMBER 18.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Duties of a Sanitary Inspector: Outdoor." 7 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary meeting of the members. 8 p.m.

FRIDAY, SEPTEMBER 20.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Duties of a Sanitary Inspector: Indoor." 7 p.m.

SATURDAY, SEPTEMBER 21.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at Wimbledon Sewage Works. 3 p.m.

CONTRACTS AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., Supplied by	Tenders to be deliver
Bridge, Blairgowrie	Perthshire County Council	Blyth & Westland, Civil Engineer, 135, George-street, Edinburgh	Sept. 17
Permanent Way Works	East Ham District Council	A. H. Campbell, Civil Engineer, Public Offices, East Ham	do.
Paving Works	Deptford Borough Council	V. Orchard, 20, Tanner's-hill, Deptford S.E.	do.
Water Main, Wallwood-street	Amble U.D.C.	W. Gibson, Surveyor, 31, Queen-street, Amble	do.
*Wood Paving Carriageways	London Corporation	The Engineer, Guildhall	do.
*Alterations to Underground Conveniences	do.	do.	do.
*Asphalt Paving Works	do.	do	do.
*Wood Paving	do.	do	do.
*Alterations to Laundries	Willesden District Council	O. Claude Robson, Public Offices, Dyne-road, Kilburn	do.
Asphalt Works at Schools	Shoreditch Guardians	F. J. Smith, Architect, Parliament Mansions, Victoria-st., S.W	Sept. 18
Main Drainage Works	Bolton School Board	G. Dickinson, School Board Offices, Bolton-upon-Dearne	do.
Water Supply Works, Yealmpton	Mytholmroyd (Yorks) U.D.C.	S. Shaw, Civil Engineer, Church-street Chambers, Dewsbury	do.
Road Works, &c.	Plympton St. Mary R.D.C.	F. W. Cleverton, 4, Buckland-terrace, Plymouth	do.
*Surplus Breeze	Wimbledon U.D.C.	C. H. Cooper, C.E., Council Offices, The Broadway, Wimbledon	do.
Pipes, Castings, &c.	Commercial Gas Company	Company's Offices, Stepney, E.	Sept. 19
*Water Tank, Oakham; Timber Platforms, Child's Hill	Bradford Corporation	F. Stevens, Town Hall, Bradford	do.
*Rebuilding Entrance Lodge, Hammersmith	Midland Railway Co.	Company's Architect, Cavendish House, Derby	do.
Road Works, King Henry's-road	Kensington, &c., School District	Guardians' Offices, Marloes-road, Kensington	Sept. 20
Works at 9, 10, 11, and 12, Princes-street, Dorchester	Lewes Town Council	Borough Surveyor, Town Hall, Lewes	do.
Schools and House, Clynderwen	Trustees	A. L. T. Tilley, Architect, Dorchester	Sept. 21
*New Schools, Whaley Thorns	Mynachlogddu School Board	W. J. Williams, 1, High-street, Cardigan	do.
*Road Making and Lighting	Bolsover School Board	Vallance & Westwick, Architects, Mansfield	Sept. 22
Staircases, &c., at Workhouse	Kingston-on-Thames Corporation	Borough Surveyor, Clattern House, Kingston-on-Thames	Sept. 23
*Supply of River Sand	Newcastle-under-Lyme Guardians	Chapman & Snape, Architects, Newcastle-under-Lyme	do.
*Pipe Surface Water Drain	Borough of St. Pancras	Borough Engineer, Town Hall, Pancras-road, N.W.	do.
20 Cottages, Trealaw, Wales	Willesden District Council	O. Claude Robson, Engineer, Dyne-road, Kilburn, N.W.	Sept. 24
*Kerbing, Channelling, &c., St. Ann's-road	New Century Building Club	A. O. Evans, Architect, Pontypridd	do.
*Making-up Roads	Tottenham U.D.C.	Engineer to Council, Offices, 712, High-road, Tottenham	do.
*Electricity Works	do.	do.	do.
*Underground Convenience, Forest Gate	Willesden District Council	O. Claude Robson, Public Offices, Dyne-road, Kilburn	do.
*Making-up Streets	West Ham Council	Borough Engineer, Town Hall, West Ham, E.	do.
*Painting Work at Hospital, Dagenham	do.	do.	do.
*Making-up Roads, &c.	do.	do.	do.
*Hospital Buildings, Royston	Wood Green U.D.C.	Surveyor to Council, Town Hall, Wood Green	Sept. 25
*Wall	Royston, &c., Jt. Hospital Board	A. Paul MacAlister, Architect, 20, St. Andrew's-st., Cambridge	do.
*Iron Fencing, carriage paid	Lewisham Metropolitan Borough	Surveyor, Town Hall, Catford	Sept. 26
*Water Works, &c.	do.	do.	do.
*New Roads, Muswell Hill	Stratton and Bude U.D.C.	Baldwin Latham, Parliament Mansions, Victoria-st., Westminster	do.
*New Coast Guard Buildings, Whitstable	C. J. Hayter, Esq.	Vigers & Co., 4, Frederick's-place, Old Jewry, E.C.	Sept. 27
Paving Works, Chipping Hill	Admiralty	Coast Guard Station, Whitstable	do.
Tramway Works, &c.	Witham (Essex) U.D.C.	W. P. Perkins, Surveyor, Witham	Sept. 28
*Shop Superstructure for Electrical Works, Stafford	Reading Corporation	J. Bowen, Civil Engineer, Town Hall, Reading	do.
*22 Houses for Working Classes	Siemens Brothers & Co., Ltd.	Siemens Brothers & Co., Ltd., Woolwich	Sept. 30
Water Supply Works	Heston and Isleworth U.D.C.	Engineer to Council, Town Hall, Hounslow	do.
*Workshops and Stores	Banff R.D.C.	J. Barron, Civil Engineer, 1, Bon Accord-street, Aberdeen	Oct. 1
*Coast Guard Buildings, Bexhill	Windsor Royal Gaslight Co.	Gas Offices, Windsor	do.
*Sewerage Works	Admiralty	Coast Guard Station, Bexhill	Oct. 4
Water Supply Works, Togan	Bideford Corporation	Baldwin Latham, Engineer, Parliament Mansions, Victoria-street	Oct. 5
Electric Lifts, &c.	Monaghan U.D.C.	J. H. M. Wilson, Civil Engineer, Monaghan	do.
*Cottages, Totterdown Fields, Tooting	London County Council	G. L. Gomme, County Hall, Spring Gardens, S.W.	Oct. 8
*Extensions at Workhouse	London County Council	Architect's Department, 18, Pall-mall East, S.W.	do.
Hospital, Pontypool	King's Norton Union	Mansell & Mansell, Colmore Row, Birmingham	do.
Pier Extension, Rosslare, Fishguard, Pembrokeshire	Hospital Committee	R. Williams, Architect, 10, Clifford-inn, London, E.C.	Oct. 10
Two Villas, Barnes-road, Castleford	Mr. J. Kershaw	Mr. Otway, Engineer, Inchicore, Dublin	Oct. 15
Wesleyan Church, Cotgrave, Notts	Mr. T. Sworder	Garside and Pennington, Architects, Wesley-street, Castleford	No date
Sheds, Stabling, &c., Manchester-street, Luton	St. Anthony's Co-operative Stores	A. E. Lambert, Architect, 22, Park-row, Nottingham	do.
Church, Monkgate, York	Mr. J. Batchelor	A. Wilkinson, Architect, 84, Inkerman-street, Luton	do.
Well Sinking, Cardiff		F. W. Dixon, Architect, Trevelyan Buildings, Manchester	do.
Additions to Store Premises, Newcastle-on-Tyne		Proger & Sons, Trinity-street, Cardiff	do.
Additions to the Red Lion Inn, Nether Broughton		T. E. Davidson, Architect, 14, Neville-street, Newcastle	do.
Additions to House, Pannal, Harrogate		Sands & Walker, Architects, Angel Row, Nottingham	do.
Four Villas, Park-avenue, Nottingham		Bland & Bown, Architects, Harrogate	do.
		H. J. Price, Architect, 24, Low Pavement, Nottingham	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Surveyor of Highways and Markets Inspector	Spalding U.D.C.	125*l.* per annum	Sept. 23
*Architectural Assistant	Coventry Corporation	Not stated	do.
*Waste Inspector and Collector of Rentals	Hemel Hempstead W'works Com.	Not stated	do.
*Three Building Inspectors	Tottenham U.D.C.	150*l.* per annum each	Sept. 24

Those marked with an asterisk (*) are advertised in this Number. Competitions, p. —. Contracts, pp. iv. vi. viii. x & xxiv. Public Appointments, pp. xxi. & xxiv.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

August 24.—By FENN & Co. (at Colchester).

Peldon, Essex.—Haxell's and Tracey's Farm, 106 a. 2 r. 11 p., f. and c. — £1,400

August 28.—By THORNBORROW & Co. (at Penrith).

Penrith, Cumberland.—Barrowgate, two shops, two houses, and cottage, f. — 551

August 29.—By WHEELER & SON (at Sudbury).

Balmer, Essex.—Balli ogdon Hill, enclosures of arable land, 68 a. r. 38 p., f. — 2,225

Middleton-rd., first, second, and third meadows, 17 a. 2 r. 25 p., f. — 900

Five Acre Meadow and Quay Meadow, 11 a. 3 r. 3 p., f. — 550

Middleton-rd., cottage and 0 a. 1 r. 7 p., f. — 235

August 30.—By ALFRED J. BURROWS (at Hamstreet).

Hamstreet, Kent.—Pear Tree House and 0 a. 2 r. 25 p., f. — 365

September 3.—By W. MARTIN & Co.

Dulwich.—Elsie-rd., Strathearne Villa, u.t. 71 yrs., g.r. 8*l.* 10s., r. 42*l.* — £425

September 5.—By CHAS. ATKINS.

Lewisham.—17 and 19, Thornford-rd., f. r. 50*l.* — 755

By NEWBON, EDWARDS, & SHEPHARD.

Stoke Newington.—47, Manor-rd., u.t. 73 yrs., g.r. 9*l.* 9s., r. 50*l.* — 500

Ilford.—55, Argyle-rd., u.t. 992 yrs., g.r. 8*l.* 11s., r. 40*l.* — 405

Holloway.—66, Isledon-rd., u.t. 50 yrs., g.r. 9*l.*, e.r. 50*l.* — 395

Pentonville.—4, Lloyd-sq., u.t. 16 yrs., g.r. 8*l.* 5s., e.r. 48*l.* — 210

September 5.—By NOTT, CARTWRIGHT, & ETCHES.

Tooting.—Mandrake-rd., f.g. rent 15*l.*, reversion in 83 yrs. — 360

Wandsworth.—Burntwood-lane, Knaresborough, u.t. 79 yrs., g.r. 6*l.*, e.r. 34*l.* — 300

Hampstead.—115, Broadhurst-gardens, u.t. 91 yrs., g.r. 21*l.* 2s. — 1,900

Pimlico.—63, 63a, and 63b, Elizabeth-st., u.t. 13 yrs., g.r. 100*l.*, r. 262*l.* — 400

Clapham.—1, 3, 5, and 7, Holland-st., u.t. 19 yrs., g.r. 80*l.*, r. 160*l.* — £385

Lee.—44, Gilmore-rd., f.r. 34*l.* — 500

Balham.—40, Gaskarth-rd., u.t. 89¾ yrs., g.r. 6*l.* 10s., r. 52*l.* — 355

By WORSFOLD & HAYWARD (at Dover).

Dover, Kent.—30, Maison Dieu-rd., u.t. 59 yrs., g.r. 5*l.* — 350

2 and 3, Barton-gdns., f. — 720

145, Clarendon-pl., f. — 215

7, Military-rd., f. — 245

16, Magdala-rd., f. — 200

Noah's Ark-rd., enclosure of building land, 11 a. 1 r. 23 p., f. — 420

September 6.—By LOW & SMYTH.

Halesworth, Suffolk.—Hill House and 4 a. 3 r. 34 p., f. — 1,760

***Contractions used in these lists.*—F.g.r.** for freehold ground-rent; **l.g.r.** for leasehold ground-rent; **i.g.r.** for improved ground-rent; **g.r.** for ground-rent; **r.** for rent; **f.** for freehold; **c.** for copyhold; **l.** for leasehold; **e.r.** for estimated rental; **u.t.** for unexpired term; **p.a.** for per annum; **yrs.** for years; **st.** for street; **rd.** for road; **sq.** for square; **pl.** for place; **ter.** for terrace; **cres.** for crescent; **yd.** for yard.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.			
Hard Stocks	1 14 0	per 1,000	alongside,	in river
Rough Stocks and Grizzles	1 11 0	,,	,,	,,
Facing Stocks	2 12 0	,,	,,	,,
Shippers	2 8 0	,,	,,	,,
Flettons	1 8 6	,,	at railway	depôt.
Red Wire Cuts	1 14 6	,,	,,	,,
Best Fareham Red	3 11 0	,,	,,	,,
Best Red pressed Ruabon Facing	5 5 0	,,	,,	,,
Best Blue Pressed Staffordshire	4 4 6	,,	,,	,,
Do., Bullnose	4 9 0	,,	,,	,,
Best Stourbridge Fire Bricks	4 2 6	,,	,,	,,
GLAZED BRICKS				
Best White and Ivory Glazed Stretchers	13 0 0	,,	,,	,,
Headers	12 0 0	,,	,,	,,
Quoins, Bullnose, and Flats	17 0 0	,,	,,	,,
Double Stretchers	19 0 0	,,	,,	,,
Double Headers	16 0 0	,,	,,	
One Side and two Ends	19 0 0	,,	,,	,,
Two Sides and one End	20 0 0	,,	,,	,,
Splays, Chamfered, Squints	20 0 0	,,	,,	,,
Best Dipped Salt Glazed Stretchers and Headers	12 0 0	,,	,,	,,
Quoins, Bullnose, and Flats	14 0 0	,,	,,	,,
Double Stretchers	15 0 0	,,	,,	,,
Double Headers	14 0 0	,,	,,	,,
One Side and two Ends	15 0 0	,,	,,	,,
Two Sides and one End	15 0 0	,,	,,	
plays, Chamfered, Squints	14 0 0	,,	,,	'
Seconds Quality White and Dipped Salt Glazed	2 0 0	,,	less than best.	

	s. d.		
Thames and Pit Sand	7 3	per yard,	delivered
Thames Ballast	6 0	,,	,,
Best Portland Cement	34 6	per ton,	delivered.
Best Ground Blue Lias Lime	25 6	,,	,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime	12s 6d.	per yard, delivered.
Stourbridge Fire-clay in sacks	28s. od.	per ton at rly. dpt.

STONE.

	s. d.			
Ancaster in blocks	2 0	per ft. cube,	deld. rly. dep't.	
Bath ,,	1 7	,,	,,	
Farleigh Down Bath	1 8	,,	,,	
Beer in blocks	1 6½	,,	,,	
Grinshill ,,	1 10	,,	,,	
Brown Portland in blocks	2 2	,,	,,	
Darley Dale in blocks	2 1½	,,	,,	
Red Corsehill ,,	2 5	,,	,,	
Red Mansfield ,,	2 4½	,,	,,	
Hard York in blocks	2 10	,,	,,	
Hard York 6 in. sawn both sides landings, to sizes (under 40 ft. sup.)	2 8	per ft. super.	at rly. depôt	
,, ,, 6 in. Rubbed Ditto	3 0	,,	,,	
,, ,, 3 in. sawn both sides slabs (random sizes)	1 3	,,	,,	
,, ,, 2 in. self-faced Ditto	0 9½	,,	,,	
Hopton Wood (Hard Bed) in blocks	2 3	per ft. cube. deld. rly. depôt		
,, ,, ,, 6-in sawn both sides landings	2 7	per ft. super. deld. rly. depôt.		
,, ,, ,, 3-in. do.	1 2½	,,	,,	

SLATES.

In. In.	£ s. d.			
20×10 best blue Bangor	11 5 0	per 1000 of 1200	at rly. dep.	
,, best seconds ,,	10 15 0	,,	,,	
16× 8 best ,,	6 2 6	,,	,,	
20×10 best blue Portmadoc	10 18 0	,,	,,	
16× 8 best blue Portmadoc	6 0 0	,,	,,	
20×10 best Eureka unfading green	11 2 6	,,	,,	
16× 8 ,, ,,	6 15 0	,,	,,	
20×10 Permanent green	10 0 0	,,	,,	
16× 8 ,, ,,	5 12 6	,,	,,	

TILES.

	s. d.			
Best plain red roofing tiles	41 6	per 1,000	at rly.	depôt
Hip and valley tiles	3 7	per doz.	,,	,,
Best Broseley tiles	48 6	per 1,000	,,	,,
Hip and valley tiles	4 0	per doz.	,,	,,
Best Ruabon Red, brown or brindled Do. (Edwards)	57 6	per 1,000	,,	,,
Do. ornamental Do.	60 0	,,	,,	,,
Hip tiles	4 0	per doz.	,,	,,
Valley tiles	3 9	,,	,,	,,
Best Red or Mottled Staffordshire Do. (Peakes)	50 9	per 1,000	,,	,,
Hip tiles	4 1	per doz.	,,	,,
Valley tiles	3 8	,,	,,	'

WOOD.

BUILDING WOOD.—YELLOW.

	At per standard. £ s. d.	£ s. d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.	14 10 0	16 13 0
Deals: best 3 by 9	13 10 0	14 10 0
Battens: best 2½ in. by 7 in. and 8 in. and 3 in. by 7 in. and 8 in.	11 0 0	12 0 0
Battens: best 2½ by 6 and 3 by 6	0 10 0	less than 7 in. and 8 in.
Deals seconds	1 0 0	less than best
Battens: seconds	0 10 0	,, ,, ,,
2 in. by 4 in. and 2 in. by 6 in.	9 0 0	10 10 0
2 in. by 4½ in. and 2 in. by 5 in.	9 0 0	10 0 0

PRICES CURRENT (*Continued*).

WOOD.

	At per standard. £ s. d.	£ s. d.
Foreign Sawn Boards—1 in. by 1½ in. by 11½ in.	0 10 0	more than battens.
¾ in.	1 0 0	,,
Fir timber: Best middling Danzig or Memel (average specification)	At per load of 50 ft. 4 10 0	5 0 0
Seconds	4 5 0	4 10 0
Small timber (8 in. to 10 in.)	3 12 6	3 15 0
Swedish balks	2 15 0	3 0 0
Pitch pine timber (35 ft. average)	3 0 0	3 10 0
JOINERS' WOOD.	At per standard.	
White Sea: First yellow deals, 3 in. by 11 in.	25 0 0	26 0 0
3 in. by 9 in.	22 0 0	23 0 0
Battens, 2½ in. and 3 in. by 7 in.	18 0 0	20 0 0
Second yellow deals, 3 in. by 11 in.	20 0 0	21 0 0
,, ,, 3 in. by 9 in.	18 0 0	19 0 0
Battens, 2½ in. and 3 in. by 7 in.	14 0 0	15 0 0
Third yellow deals, 3 in. by 11 in. and 9 in.	14 10 0	15 10 0
Battens, 2½ in. and 3 in. by 7 in.	12 0 0	12 10 0
Petersburg: first yellow deals, 3 in. by 11 in.	22 0 0	23 0 0
Do. 3 in. by 9 in.	19 0 0	20 0 0
Battens	14 0 0	15 0 0
Second yellow deals, 3 in. by 11 in.	15 10 0	16 10 0
Do. 3 in. by 9 in.	14 0 0	15 0 0
Battens	11 12 0	12 0 0
Third yellow deals, 3 in. by 11 in.	13 10 0	14 10 0
Do. 3 in. by 9 in.	13 0 0	13 10 0
Battens	10 10 0	11 10 0
White Sea and Petersburg:—		
First white deals, 3 in. by 11 in.	15 0 0	16 0 0
,, ,, ,, 3 in. by 9 in.	14 0 0	15 0 0
Battens	12 0 0	13 0 0
Second white deals 3 in. by 11 in.	14 0 0	15 0 0
,, ,, ,, 3 in. by 9 in.	13 0 0	14 0 0
,, ,, battens	10 10 0	11 10 0
Pitch pine: deals	16 0 0	18 0 0
Under 2 in. thick extra	0 10 0	1 0 0
Yellow Pine—		
First, regular sizes	30 0 0	33 0 0
Broads (12 in. and up)	2 0 0	more.
Oddments	22 0 0	24 0 0
Seconds, regular sizes	24 10 0	26 10 0
Yellow Pine Oddments	20 0 0	22 0 0
Kauri Pine—Planks, per ft. cube	0 3 6	0 4 6
Danzig and Stettin Oak Logs—		
Large, per ft. cube	0 2 6	0 3 0
Small ,, ,,	0 2 3	0 2 6
Wainscot Oak Logs, per ft. cube	0 5 0	0 5 6
Dry Wainscot Oak, per ft. sup. as inch	0 0 8	0 0 7
in. do. do.	0 0 7	- - -
Dry Mahogany—		
Honduras, Tabasco, per ft. sup. as inch	0 0 9	0 0 11
Selected, Figury, per ft. sup. as inch	0 1 6	0 2 0
Dry Walnut, American, per ft. sup. as inch	0 0 10	0 1 0
Teak, per load	16 0 0	20 0 0
American Whitewood Planks—		
Per ft. cube	0 3 0	0 3 6
Prepared Flooring—	Per square	
1 in. by 7 in. yellow, planed and shot	0 13 6	0 16 6
1 in. by 7 in. yellow, planed and matched	0 13 6	0 17 6
1¼ in. by 7 in. yellow, planed and matched	0 16 0	1 1 0
6 in. at 6d. per square less than 7 in.		
1 in. by 7 in. white, planed and shot	0 11 0	0 13 0
1 in. by 7 in. white, planed and matched	0 11 6	0 13 6
1¼ in. by 7 in. white, planed and matched	0 14 0	0 16 6
6 in. at 6d. per square less than 7 in.		

JOISTS, GIRDERS, &c.

	In London, or delivered to Railway Vans, per ton. £ s. d.	£ s. d.
Rolled Steel Joists, ordinary sections	6 15 0	7 15 0
Compound Girders ,, ,,	8 15 0	10 0 0
Angles, Tees and Channels, ordinary sections	8 12 6	10 12 6
Flitch Plates	8 15 0	9 10 0
Cast Iron Columns and Stanchions, including ordinary patterns	7 5 0	9 0 0

METALS.

IRON.—	Per ton, in London. £ s. d.	£ s. d.
Common Bars	8 0 0	8 10 0
Staffordshire Crown Bars, good merchant quality	8 10 0	9 0 0
Staffordshire "Marked Bars"	10 10 0	- - -
Mild Steel Bars	9 0 0	9 10 0
Hoop Iron, basis price	9 5 0	9 15 0
,, ,, galvanised	16 0 0	- - -
(* And upwards, according to size and gauge.)		
Sheet Iron, Black.—		
Ordinary sizes to 20 g.	10 0 0	- - -
,, ,, to 24 g.	11 0 0	- - -
,, ,, to 26 g.	12 10 0	- - -
Sheet Iron, Galvanised, flat, ordinary quality.—		
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	12 10 0	- - -
,, ,, 22 g. and 24 g.	13 0 0	- - -
,, ,, 26 g.	14 0 0	- - -
Sheet Iron, galvanised, flat, best quality.—		
Ordinary sizes to 20 g.	16 10 0	- - -
,, ,, 22 g. and 24 g.	17 0 0	- - -
,, ,, 26 g.	18 10 0	- - -
Galvanised Corrugated Sheets.—		
Ordinary sizes, 6 ft. to 8 ft. 20 g.	12 10 0	- - -
,, ,, 22 g. and 24 g.	13 0 0	- - -
,, ,, 26 g.	14 0 0	- - -
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker	12 5 0	- - -
,, ,, 22 g. and 24 g.	13 5 0	- - -
,, ,, 26 g.	14 5 0	- - -
Cut nails, 3 in. to 6 in. (Under 3 in. usual trade extras.)	9 10 0	10 0 0

PRICES CURRENT (*Continued*).

LEAD, &c.

	Per ton, in London. £ s. d.	£ s. d.
LEAD—Sheet, English, 3 lbs. & up.	14 17 6	- - -
Pipe in coils	15 7 6	- - -
Soil Pipe	17 17 6	- - -
ZINC—Sheet—		
Vieille Montagne ton	24 10 0	- - -
Silesian	24 0 0	- - -
COPPER—		
Strong Sheet per lb.	0 1 0½	- - -
Thin ,,	0 1 2	- - -
Copper nails ,,	0 1 2	- - -
BRASS—		
Strong Sheet ,,	0 0 11	- - -
Thin ,, ,,	0 1 1	- - -
TIN—English Ingots ,,	0 1 4½	- - -
SOLDER—Plumbers' ,,	0 0 7	- - -
Tinmen's ,,	0 0 8	- - -
Blowpipe ,,	0 0 9	- - -

PLASTER, &c.

	s. d.		
Coarse Plaster	30 6	per ton	delivered.
Fine ,,	47 6	,,	,,
Superfine ,,	88 6	,,	,,
Coarse Keenes and Parian cement	55 0	,,	,,
Fine do. do.	75 0	,,	,,
Robinson's Fireproof Cement	50 0	,,	,,
Do. Fine white, finishing (Exclusive of the ordinary charge for sacks.	55 0	,,	,,
Whiting	27 0 to 30 0	,,	,,
Cow hair for plastering	£9 0 0	,,	,,

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	3d.	per ft.	delivered.
,, ,, fourths	2¾d.	,,	,,
21 oz. thirds	3¾d.	,,	,,
,, ,, fourths	3½d.	,,	,,
26 oz. thirds	5d.	,,	,,
,, ,, fourths	4¼d.	,,	,,
32 oz. thirds	6d.	,,	,,
,, ,, fourths	5¼d.	,,	,,
Fluted sheet, 15 oz.	3½d.	,,	,,
,, ,, 21 ,,	4¼d.	,,	,,
½ Hartley's Rolled Plate	3d.	,,	'
⅔ ,, ,, ,,	3½d.	,,	'
½ ,, ,,	4d.	,,	

OILS, &c.

		£ s. d
Raw Linseed Oil in pipes	per gallon	0 2 10
,, ,, ,, in barrels	,,	0 2 11
,, ,, ,, in drums	,,	0 3 1
Boiled ,, ,, in pipes	,,	0 3 0
,, ,, ,, in barrels	,,	0 3 1
,, ,, ,, in drums	,,	0 3 3
Turpentine, in barrels	,,	0 2 3
,, in drums	,,	0 2 5
Genuine Ground English White Lead	per ton	22 0 0
Red Lead, Dry	,,	22 10 0
Best Linseed Oil Putty	per cwt.	0 9 0
Stockholm Tar	per barrel	1 10 0

VARNISHES, &c.

	per gallon £ s. d
Fine Elastic Copal Varnish for outside work	0 16 6
Best Elastic Copal Varnish for outside work	1 0 0
Best Elastic Carriage Varnish for outside work	0 16 0
Best Hard Oak Varnish for inside work	0 10 6
Best Extra Hard Church Oak Varnish for inside work	0 10 6
Fine Hard Copal Varnish for inside work	0 16 0
Best Hard Copal Varnish for inside work	1 0 0
Best Hard Carriage Varnish for inside work	0 16 0
Extra Pale Paper Varnish	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 6
Berlin Black	0 16 0
Knotting	0 10 0
Best French and Brush Polish	0 10 0

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[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays*. N.B.—We cannot publish tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of tenders accepted unless the amount of the tender is given, nor any list in which the lowest tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted*. † Denotes *provisionally accepted*.

AYLESBURY.—For rebuilding the Railway Tavern, Aylesbury. Mr. Guest Luckett, architect, Aylesbury:—
Senior & Clarke*.....£613
[Lowest of three tenders received.]

See also next page.

HENDON.—For fully making-up Borthwick-road, Ravenshurst-avenue, and Cricklewood-lane widening for Urban District Council of Hendon. Mr. S. Slater Grimley, Engineer :—

	Borthwick-road.	Ravenshurst-avenue.	Cricklewood-lane.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Meston & Hale, Harlesden	1,064 0 5*	820 17 0	736 16 2	2,621 13 7
Bentham & Co.	1,110 9 4	982 0 4	683 9 0	2,775 18 8
T. Adams, Wood Green	1,122 16 3	1,042 10 4*	769 1 0	2,934 7 7
Myers, Gilson, & Rose	1,178 6 6	1,081 4 2	755 7 9	3,014 18 5
H. Boyer, Paddington	—	—	717 7 6*	717 7 6
Surveyor's estimate, inclusive of all ironwork, &c., to be supplied by Council	1,128 19 5	1,026 14 7	795 6 2	—

BANGOR (Wales).—For alterations to 13, Dean-street. Mr. W. G. Williams, architect, 220, High-street, Bangor :—

R. & J. Williams	£519	Watkin Jones, Mount-street‡	£499
Wm. Parry, jun.	519		

‡ Recommended for acceptance.

BANGOR (Wales).—For the erection of lock-up premises, Upper Bangor, for Mr. D. Cameron. Mr. W. G. Williams, architect, 220, High-street, Bangor :—

R. & J. Williams	£766 0	Jones & Evans	£762 0
Watkin Jones	764 15	Wm. Parry, jun.*	755 0
R. Lewis	763 0		

BOSTON (Lincs).—For the erection of a cookery centre, Norfolk-street, for the School Board. Mr. Jas. Rowell, architect, Market-place, Boston :—

Parker & Son, Boston, Lincs* £1,929

BRISTOL.—For converting a dwelling-house into business premises. Mr. T. J. Moss-Flower, architect and surveyor, 28, Victoria-street, Westminster, and Scottish Buildings, Bristol :—

Denby & Co, Bristol* £729

[Exclusive of electric lighting, drainage, and plumbers' work.]

KILLYGORDON (Ireland).—For the erection of a shop and dwelling-house, for Messrs. Floyd & Co. Mr. J. M'Carry, architect, Stranorlar :—

Carpentry.—Patrick Diver, Donegal £769 10

Building.—Maxwell, McGrenghnan, & Co., Killygordon* 434 10

LEEDS.—For the execution of road works (tar macadam), Cross Flatts Park, for the Corporation :—

Keighley & Riddiough, Globe-road, Leeds, 2s. 9d. per square yard.

MERRINGTON-LANE (Co. Durham).—For the erection of a mission hall, for the Rev. E. Fenton. Mr. S. Wilkinson, architect, Mosley Chambers, Newcastle :—

G. H. Bell	£877 15 3	J. Ross	£802 10 2
R. Telfer	826 10 0		

QUAINTON (Aylesbury, Bucks).—For carrying out a scheme of water supply to the Station-road, Quainton, for the Aylesbury Rural District Council. Mr. Guest Luckett, engineer, Aylesbury :—

Hill	£1,771 9 0	Ward & Cannon	£1,156 0 0
Harvey	1,398 10 0	Rowell & Sons	1,131 11 2
Senior & Clarke	1,316 16 0	King, Grace, & Cannon, Quainton*	1,032 10 0
Darlington	1,271 0 0		
Mackrill & Sons	1,220 0 0		
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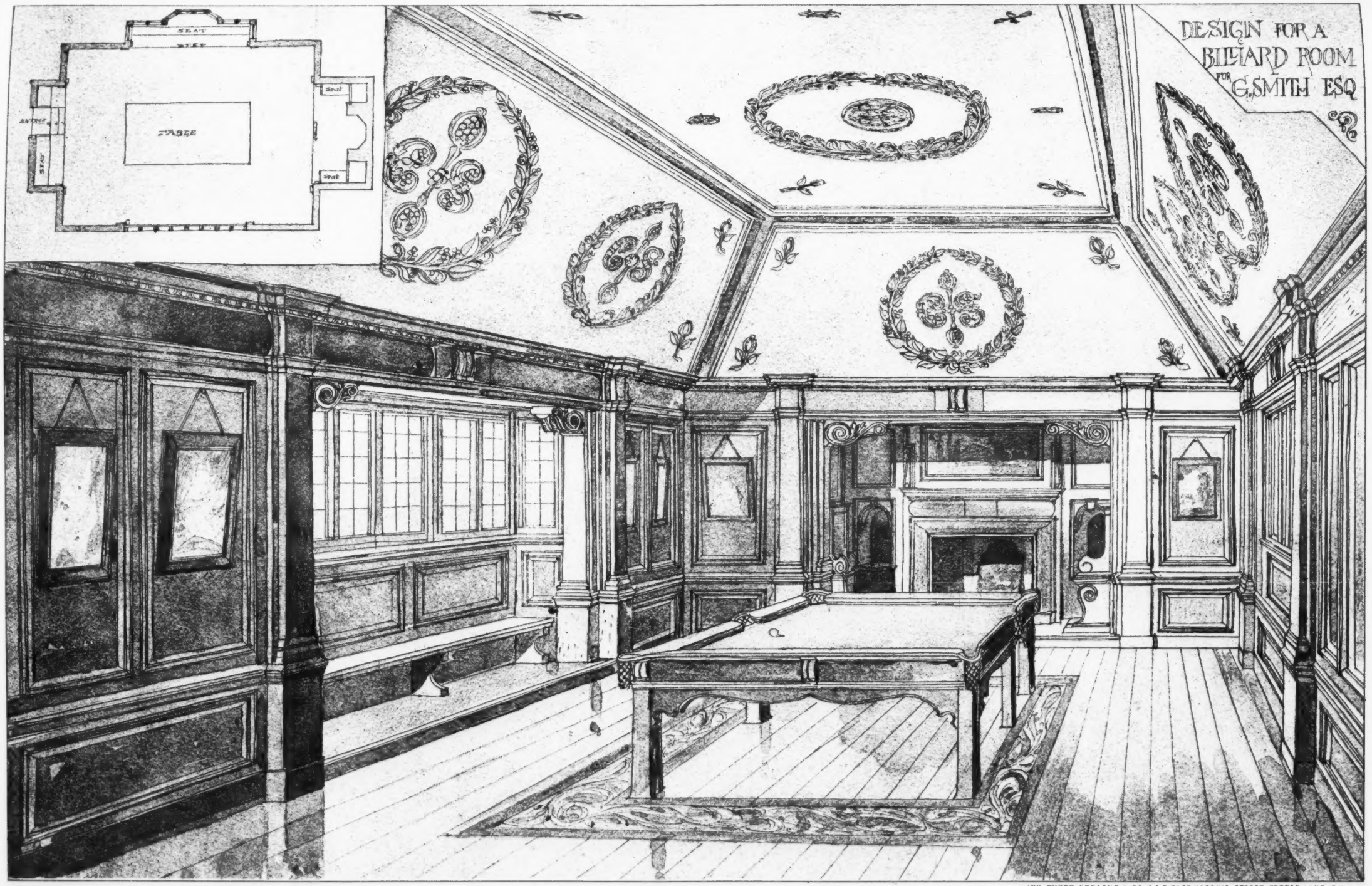

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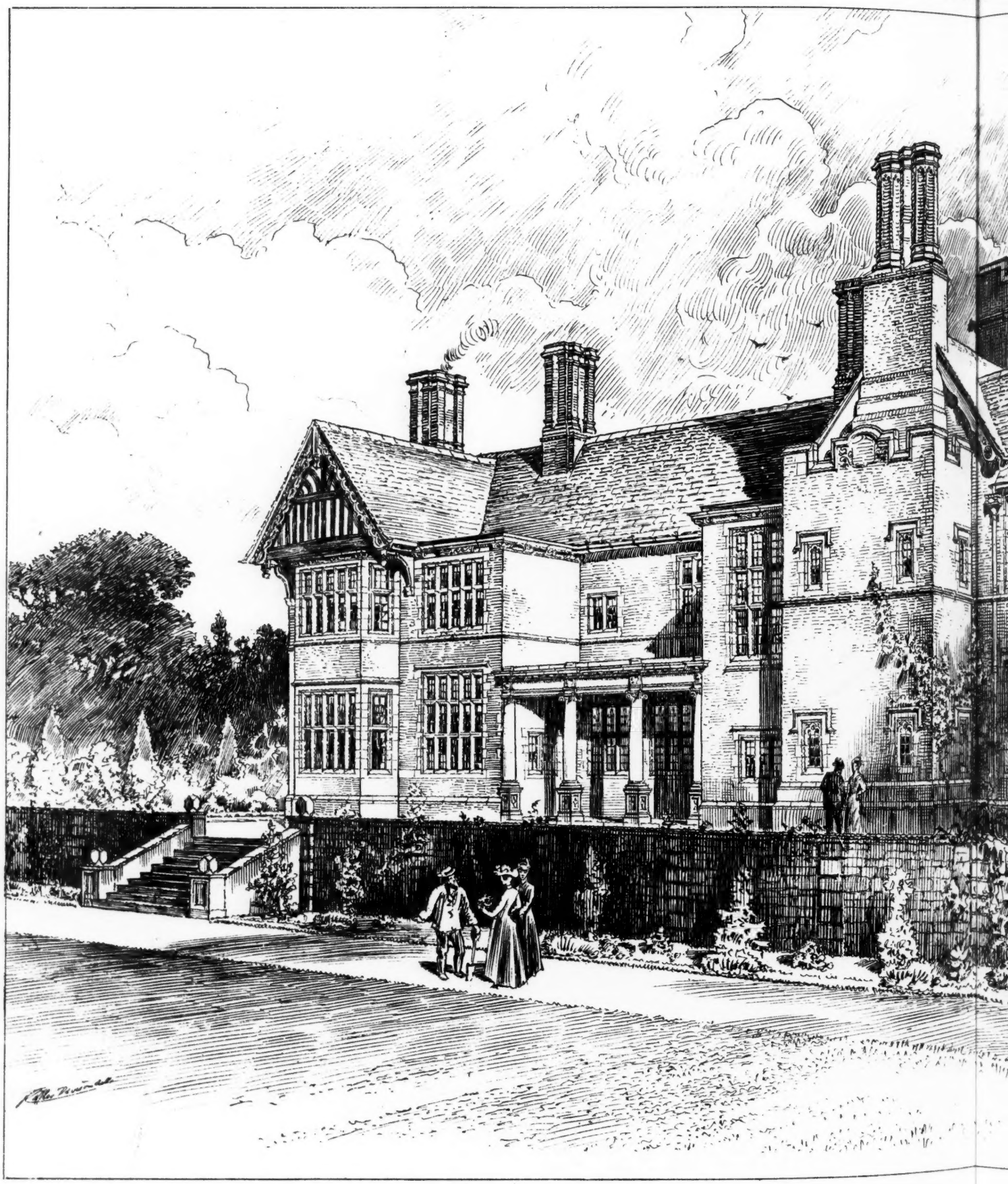

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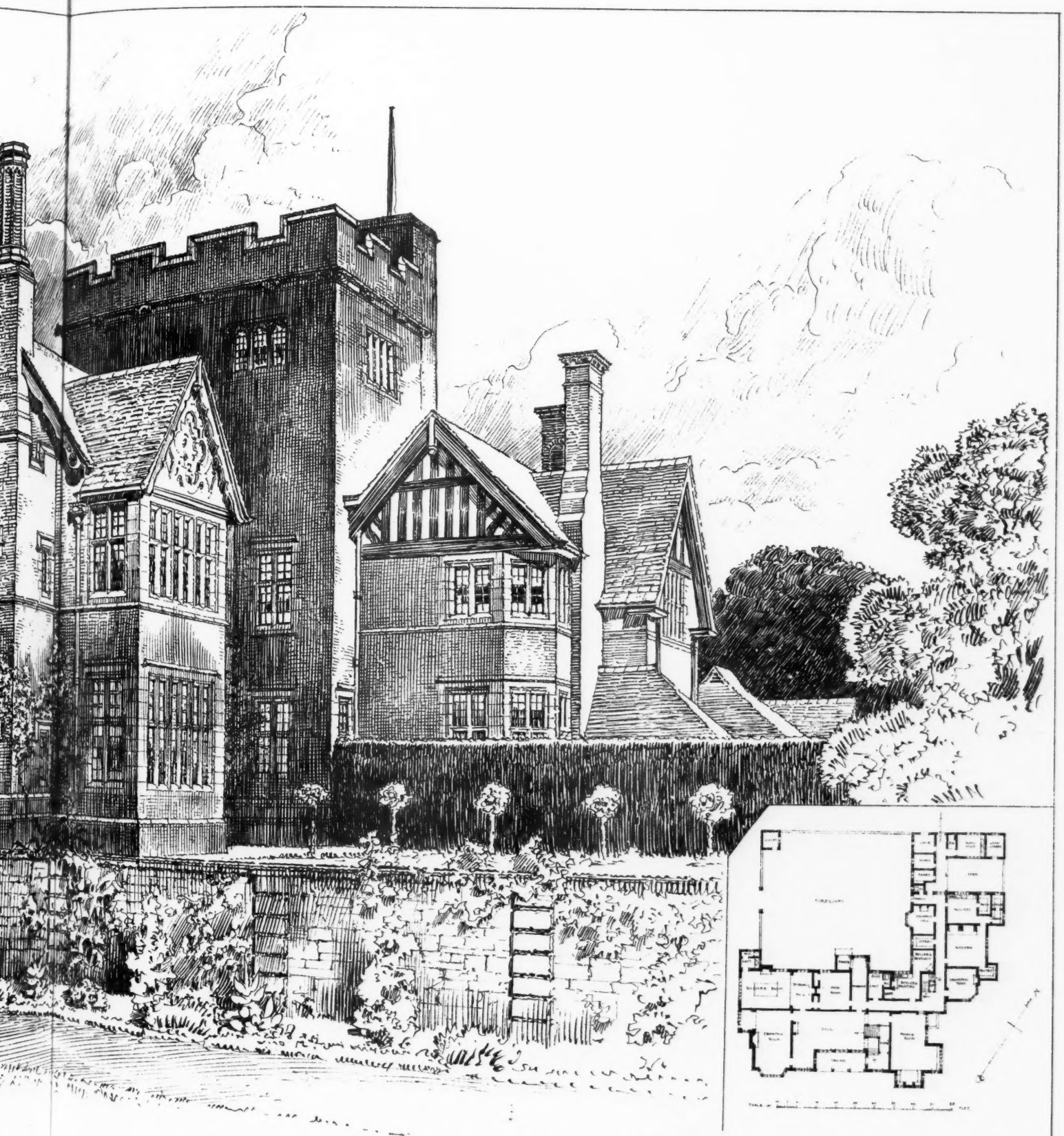

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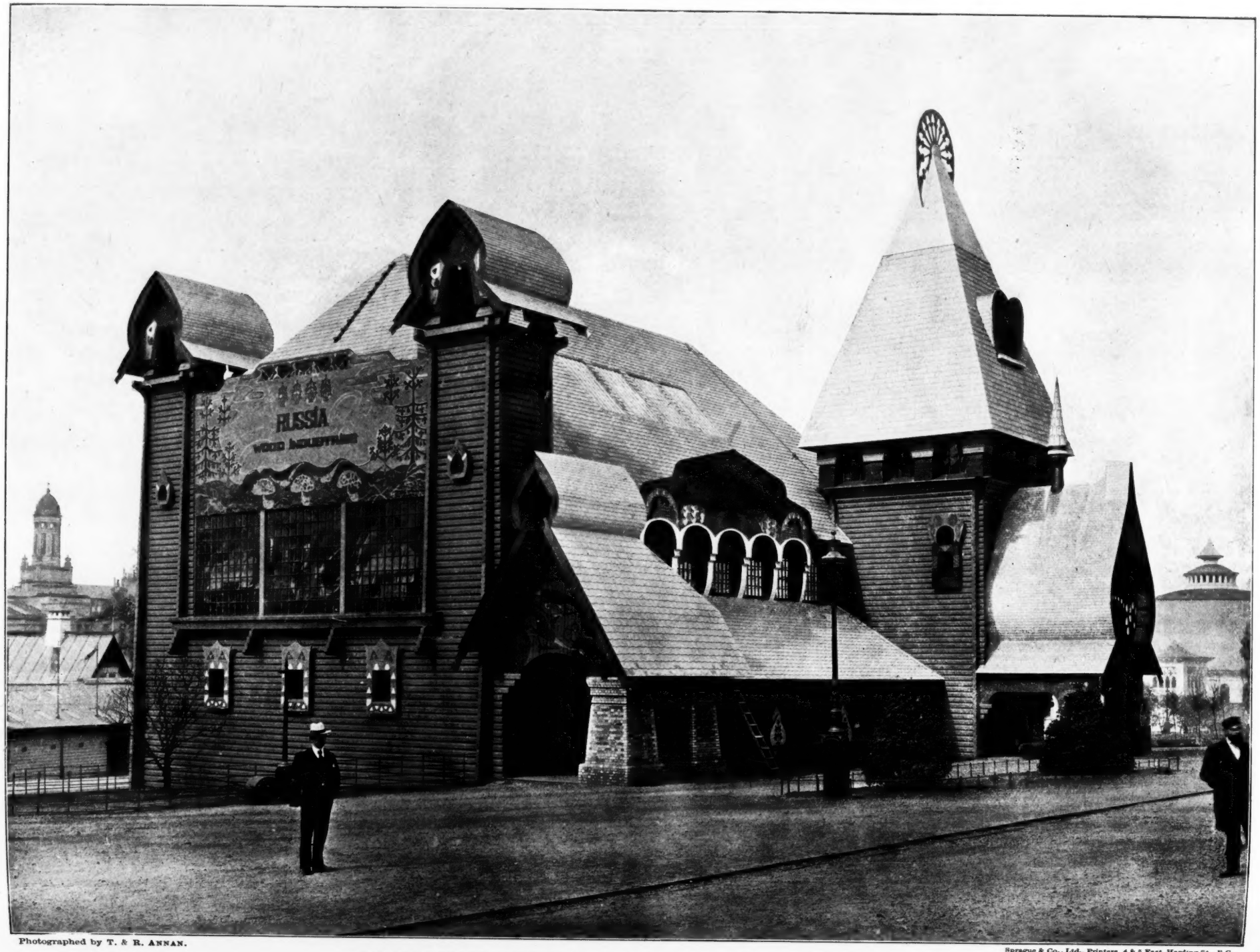

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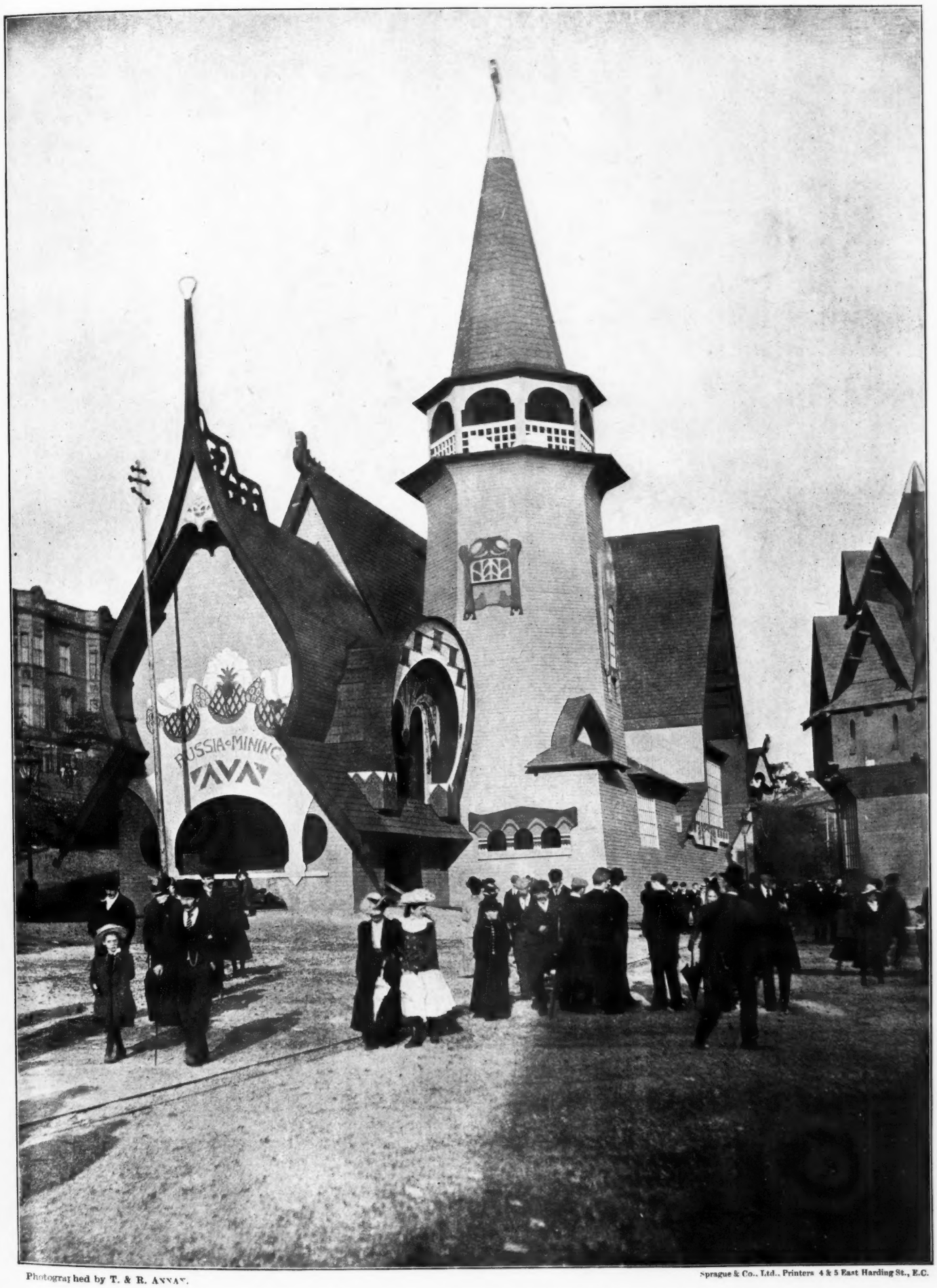

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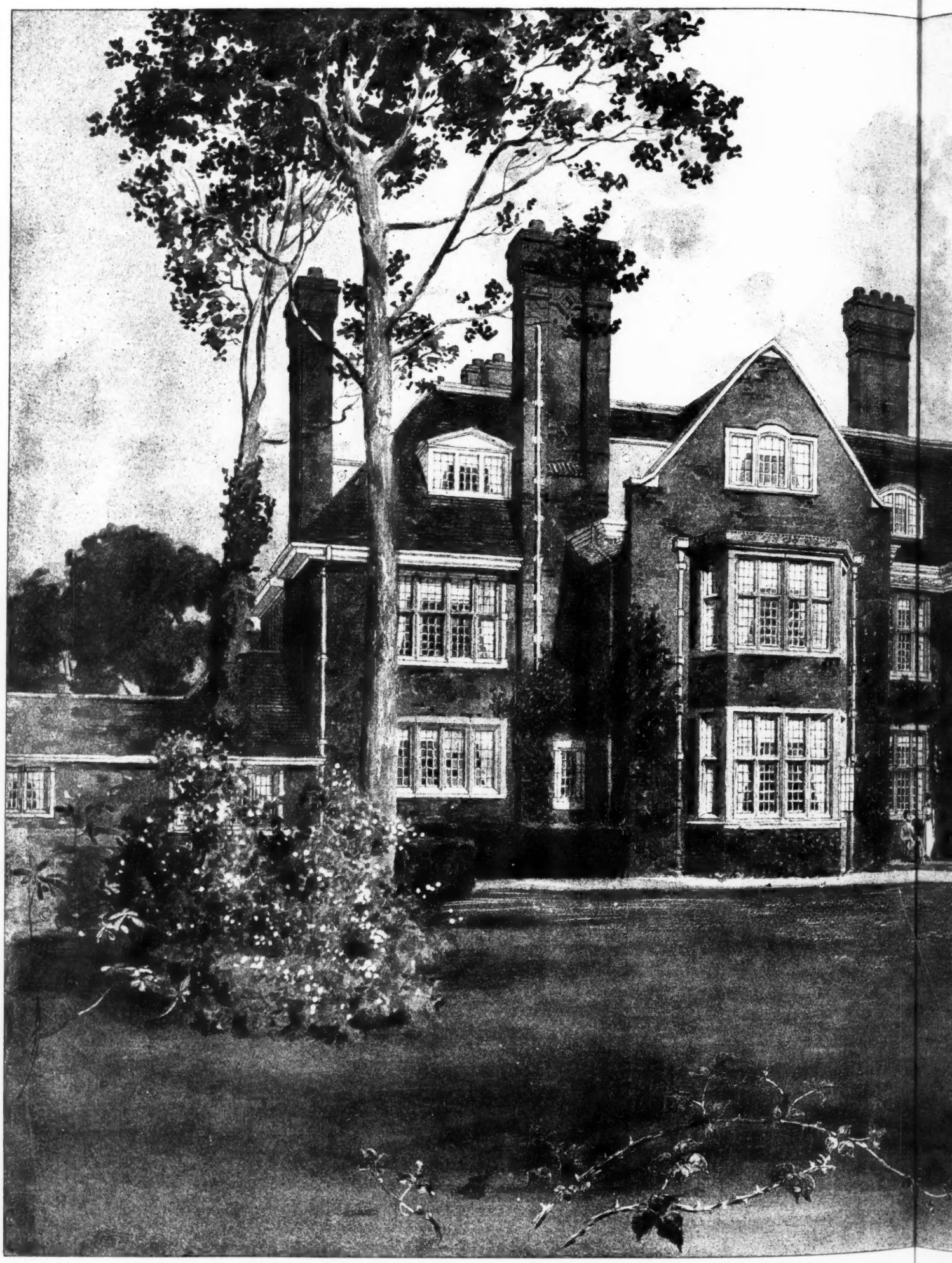

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